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PREFACE

GASTROENTEROLOGY ABSTRACTS and CITATIONS is a publication of the National Institute of Arthritis, Metabolism and Digestive Diseases. This specialized information medium has been initiated to fill an existing great need in the field of gastroenterology and to assist the Institute in meeting its obligations to foster and support laboratory and clinical research into the nature, causes, and therapy of diseases of the gastrointestinal tract. Publication GASTROENTEROLOGY ABSTRACTS and CITATIONS makes available citations of all current papers relevant to this field from medical journals published throughout the world. Approximately one-third of the citations dealing with the major aspects of gastroenterology have accompanying abstracts.

The issuing of GASTROENTEROLOGY ABSTRACTS and CITATIONS under the auspices of the National Institute of Arthritis, Metabolism, and Digestive Diseases will provide a much needed current awareness tool to scientists and will facilitate greater integration of research and clinical efforts in this field. The number and great diversity of publications in the area of gastroenterology makes it imperative that an appropriate service be available to investigators and practitioners so that they may be apprised of progress with a minimum of delay. Our aim is to provide the readers with a readily systematized compilation of current published work. The publication will provide the greatest usefulness if these interested investigators will contribute their ideas and comments for consideration whenever possible.

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LANGUAGE ABBREVIATIONS

Afr.	Afrikaans	It.	Italian
Ar.	Arabic	Jpn.	Japanese
Bul.	Bulgarian	Kor.	Korean
Ch.	Chinese	Latv.	Latvian
Cz.	Czech	Lith.	Lithuanian
Dan.	Danish	Nor.	Norwegian
Dut.	Dutch	Pol.	Polish
E.	English	Por.	Portuguese
Eston.	Estonian	Rum.	Rumanian
Fin.	Finnish	Rus.	Russian
Fl.	Flemish	Ser.	Serbo-Croatian
Fr.	French	Sl.	Slovak
Ger.	German	Sp.	Spanish
Gr.	Greek	Sw.	Swedish
Heb.	Hebrew	Th.	Thai
Hun.	Hungarian	Turk.	Turkish
Ic.	Icelandic	Uk.	Ukrainian
In.	Indonesian	Viet.	Vietnamese

ABBREVIATIONS USED IN ABSTRACTS

ACTH	adrenocorticotropic hormone	mm	millimeter(s)
ADP	adenosine diphosphate	mOsm	milliosmolar; milliosmeter(s)
AMP	adenosine monophosphate	msec	millisecond(s)
amp	ampere	mV	millivolt(s)
ATP	adenosine triphosphate	min	minute(s)
Å	angstrom	MTD	maximum tolerated dose
BSP	sulfobromophthalein	NAD	nicotanamide adenine dinucleotide
C	degrees centigrade	NADH	reduced nicotanamide adenine dinucleotide
cal	calories	NADP	nicotanamide adenine dinucleotide phosphate
cc	cubic centimeter	NADPH	reduced nicotanamide adenine dinucleotide phosphate
cm	centimeter(s)	ng	nanogram (10^{-9})
dl	deciliter	nm	nanometer(s)
DNA	deoxyribonucleic acid	Pa	ambient pressure
ED_{50}	median effective dose(s)	PAS	periodic acid-Schiff
EDTA	ethylenediamine tetraacetic acid	pg	picogram (10^{-12})
e.g.	for example	pgEq	picogram equivalent(s)
EEG	electroencephalogram	p.o.	orally
ESR	erythrocvte sedimentation rate	ppb	parts per billion
g	gram(s)	ppm	parts per million
μg	microgram(s)	r	Roentgen
Hz	Herz	RBC	red blood cells (erythrocytes), red blood count
hr	hour(s)	resp.	respectively
i.m.	intramuscular	RNA	ribonucleic acid
i.p.	intraperitoneal	s.c.	subcutaneous
IU	international unit(s)	sec	second(s)
i.v.	intravenous	SGOT	serum glutamic-oxalacetic transaminase
kcal	kilocalorie(s)	SGPT	serum glutamic-pyruvic transaminase
kg	kilogram(s)	U	unit(s)
K_m	Michaelis constant	UV	ultraviolet
LD_{50}	median lethal dose(s)	V	volt
LDH	lactic acid dehydrogenase	WBC	white blood cells (leukocytes), white blood count
m	meter(s)	yr	year(s)
M	molar; mole(s)		
mM	millimolar; millimole(s)		
μM	micromolar; micromole(s)		
ma	milliampere(s)		
mCi, μCi	milli-, microcurie(s)		
mEq	milliequivalent(s)		
mg	milligram(s)		
ml, μl	milli-, microliter(s)		

PRE-CLINICAL SCIENCES

MORPHOLOGY, CELLULAR STRUCTURE AND HISTOCHEMISTRY

0001 CORRELATIVE LIGHT AND ELECTRON MICROSCOPICAL STUDIES ON THE G (GASTRIN) AND D ENDOCRINE CELL TYPES OF THE HUMAN PYLORIC MUCOSA.

(E.) Canese, M. G.; Bussolati, G. (Fac. Med., Turin Univ., Italy). *Rend. Gastroenterol.* 6(1):12-22, 1974.

The staining characteristics and the ultrastructural morphology of the endocrine cells of the human pyloric mucosa, obtained from 2 stomachs surgically removed because of duodenal ulcer, were correlated on serial sections. With the indirect immunofluorescence procedure numerous gastrin-containing cells were detected in the pyloric glands. Gastrin cells were detected by immunofluorescence in semithin sections from aldehyde-fixed, Epon-araldite embedded tissues. Similar results were obtained using osmium to post-fix the cells. In aldehyde-fixed, osmium post-fixed tissues several cell types could be recognized on electron microscopy, the most prominent in number being the G cell, with typical round, "floccular" granules. Numerous D cells were also observed, while only a few enterochromaffin cells and rare cells with round, small granules (D$_1$ cells) were seen. In tissues fixed in aldehyde alone, the endocrine granules did not display the typical morphology because of the lack of membrane staining. The endocrine cells selectively stained by immunofluorescence, histological and histochemical methods in light microscopy were traced on the ultrastructural sections. In most instances, the transfer process from light to electron microscopy, and *vice versa*, was successful. The gastrin cells detected by immunofluorescence were easily identifiable in tissues post-fixed in osmium and characterized in electron microscopy by all the features which are known to be typical of the G cells. The D cells were negative with the immunofluorescence method for gastrin. The argyrophilic Davenport-positive cells and the metachromatic cells positive with the HCl-Toluidine Blue method were identified as corresponding to the D cell type. The discrepancy between these findings and those from other authors is attributed to experimental methodology. The authors conclude that this study leaves no doubt that G cells produce gastrin, but that the function of D cells is still unknown.

0002 ORIGIN, DIFFERENTIATION AND RENEWAL OF THE FOUR MAIN EPITHELIAL CELL TYPES IN THE MOUSE SMALL INTESTINE. I. COLUMNAR CELL.

(E.) Cheng, H.; Leblond, C. P. (Dep. Anat., McGill Univ., Montreal, Canada). *Am. J. Anat.* 141(4):461-480, 1974.

The distribution and behavior of epithelial columnar cells from the duodenum, jejunum, and ileum of adult Swiss mice sacrificed at various times after single injection or continuous infusion of ^{3}H-thymidine were studied with light and electron microscopy and autoradiography. A single s.c. injection of 1 µCi/g of labeled thymidine to 8 female mice resulted in 96% or more of the labeled cells being free of secretory granules, and thus columnar, 1 hr after injection. These columnar cells accounted for 92.4, 86.0, and 84.1% of the cells in the crypts of the duodenum, jejunum, and ileum, resp. and 97.3, 95.0, and 87.6% of the cells in the villi of the duodenum, jejunum, and ileum, resp. These high percentages indicate the likelihood of columnar cells playing a key role in the renewal of the epithelium in the small intestine. The turnover time of columnar cells, estimated from the results of continuous infusion of labeled thymidine (1.5 µCi/g/day) to male mice sacrificed in groups of 2 at 10 hr, 2 days, and 4 days, was 3.3 days in the duodenum and 3.4 days in the jejunum. The turnover time data indicate that the mitoses of columnar cells produce more cells than required for their own renewal, with some of the mitoses presumably giving rise to cells of other types. Electron microscopic studies of columnar cells at different levels of the epithelium following a single i.p. injection of 2 µCi/g of labeled thymidine to 30 male mice sacrificed from 1-144 hr after injection indicated that columnar cells exhibit local differences. They were classified into 4 subgroups: (I) crypt-base columnar cells, immature proliferative cells occupying the 9 lowest cell positions of the crypt; (II) mid-crypt columnar cells, proliferative rudimentary differentiating cells occupying the next positions up to 19 in the ileum and 27 in the duodenum and jejunum; (III) crypt-top columnar cells, nonproliferating differentiating cells occupying the rest of the crypt; (IV) villus columnar cells, fully differentiated absorptive cells. The migration of labeled columnar cells from crypt to villus was visualized with light-microscopic examination of autoradiographs. In the jejunum, 1 hr after labeled thymidine injection (2 µCi/g), heavily labeled columnar cells were confined to crypt-base and mid-crypt positions. By 6 hr heavily labeled cells appeared in the crypt-top and by 12 hr at the base of some villi, while labeling intensity decreased in the lower portions of the crypts. Thereafter, heavily labeled columnar cells were observed ascending the villus epithelium and eventually reaching the villus tip where they dropped into the lumen.

0003 ORIGIN, DIFFERENTIATION AND RENEWAL OF THE FOUR MAIN EPITHELIAL CELL TYPES IN THE MOUSE SMALL INTESTINE. II. MUCOUS CELLS.

(E.) Cheng, H. (Dep. Anat., McGill Univ., Montreal, Canada). *Am. J. Anat.* 141(4):481-502, 1974.

The distribution and behavior of eipthelial mucous cells from the duodenum, jejunum, and ileum of adult Swiss mice sacrificed at various times after single injection or continuous infusion of ^{3}H-thymidine were studied with light and electron microscopy and autoradiography. Single s.c. injection of 1 µCi/g of labeled thymidine to 8 female mice resulted in the characterization of 2 types of mucous cells: granular and common. The granular mucous cells differ from the common ones by the presence of small dense granules embedded within the mucous globules. Each subgroup was further subdivided into immature oligomucous cells containing few mucous globules and mature goblet cells. Common and granular oligomucous cells were found exclusively in the crypt, mainly within the lower mid-crypt, whereas the 2 types of goblet cells were present in the upper part of the crypts and in the lower part of the villi. Only common mucous cells were observed in the upper part of the villi. Electron microscopic autoradiography after single i.p. injection of 2 μCi/g labeled thymidine to 30 male mice sacrificed at time intervals ranging from 1-144 hr demonstrated that as oligomucous cells migrate upwards, they transform into goblet cells which in turn migrate to the villus epithelium. These findings were also observed after continuous infusion of 1.5 μCi/g/day of labeled thymidine to male mice divided into groups of 2, sacrificed after 10 hr, 2 days, and 4 days. The labeling pattern of granular mucous cells was determined after single i.p. injection of labeled thymidine (1 μCi/g) to 45 female mice sacrificed at intervals ranging from 1-336 hr. Granular mucous cell migration was associated with a gradual loss of the characteristic dense granules, so that the granular goblet cells reaching the upper part of the villi became common goblet cells. The goblet cells in the villus epithelium, regardless of their origin, ascended towards the villus tips where they were lost through the extrusion zones. The turnover time of common mucous cells was about 3 days, being somewhat shorter for granular types. Divisions of oligomucous cells accounted for the production of only about half of the mucous cells present. Hence, the other half must have been derived from precursors other than oligomucous cells. Since a few crypt-base columnar cells contained the odd mucous globule, these were suspected as being the precursors of the 2 types of oligomucous cells and, through them, the entire mucous cell population.

0004 ORIGIN, DIFFERENTIATION AND RENEWAL OF THE FOUR MAIN EPITHELIAL CELL TYPES IN THE MOUSE SMALL INTESTINE. III. ENTERO-ENDOCRINE CELLS.

(E.) Cheng, H.; Leblond, C. P. (Dep. Anat., McGill Univ., Montreal, Canada). *Am. J. Anat.* 141(4):503-520, 1974.

The distribution and behavior of epithelial entero-endocrine cells from the duodenum, jejunum, and ileum of adult Swiss mice sacrificed at various times after single injection or continuous infusion of ^{3}H-thymidine were studied with light and electron microscopy and autoradiography. Although light microscopic examination after s.c. injection of 1 μCi/g of labeled thymidine to 8 female mice did not reveal mitosis in the entero-endocrine cells (iron hematoxylin stained), electron microscopy identified a few cells that contained a small number of characteristic granules, some filament bundles, and many free ribosomes that were in division or were labeled 1 hr after injection. These cells were interpreted as young entero-endocrine cells. They were located in the crypt base and resembled crypt-base columnar cells which perhaps gave rise to them. Cell differentiation was examined by following the fate of the young entero-endocrine cells after a single i.p. injection of 2 μCi/g labeled thymidine to 30 male mice. When s-collidine buffered glutaraldehyde was used for fixation prior to electron microscopic study, all granules in all entero-endocrine cells were spheroidal, and thus their shape could not be used to classify the cells into subgroups. Fixation with glutaraldehyde in phosphate buffer resulted in the observation of both irregular and spheroidal granules. The shape of the granules seemed to be influenced only by the buffer. Within the crypts, these cells acquired a gradually increasing number of granules, while losing the ability to divide. The few granules initially present usually had a particulate content; but, as differentiation proceeded and granules accumulated, their content was mostly dense and homogeneous. The differentiation of precursor cells into mature entero-endocrine cells took about 2 days. In the same manner as columnar and mucous cells, entero-endocrine cells migrated up the crypt, reached the villus, and were lost at the extrusion zone. Infusion of 1.5 μCi/g/day of labeled thymidine to male mice divided into groups of 2 sacrificed after 10 hr, 2 days, and 4 days allowed for turnover time estimates of 3.9 days in the duodenum and 4.0 days in the jejunum.

0005 ORIGIN, DIFFERENTIATION AND RENEWAL OF THE FOUR MAIN EPITHELIAL CELL TYPES IN THE MOUSE SMALL INTESTINE. IV. PANETH CELLS.

(E.) Cheng, H. (Dep. Anat., McGill Univ., Montreal, Canada). *Am. J. Anat.* 141(4):521-536, 1974.

The distribution and behavior of epithelial Paneth cells from the small intestine of adult Swiss mice sacrificed at various times after single injections of ^{3}H-thymidine were studied with light and electron microscopic autoradiography. Injection (s.c.) of 8 female mice with 1 μCi/g labeled thymidine revealed that Paneth cells make up 3.3% of the crypt epithelial cells in the duodenum, 7.5% of the cells in the jejunum, and 6.6% of the cells in the ileum. The Paneth cell population consisted of 23% young Paneth cells with granules less than 2 μ in diameter, 63% mature Paneth cells with granules 2-3 μ in diameter, and 14% old Paneth cells with granules greater than 3 μ in diameter. Light and electron microscopic autoradiography confirmed that typical Paneth cells are not labeled 1 hr after thymidine injection and, therefore, are not capable of proliferation. Labeled cells with a few small Paneth cell granules were, however, observed 12 hr after injection. Except for the presence of granules, these cells were indistinguishable from the highly proliferative crypt-base columnar cells which are suspected to be the precursors of Paneth cells. Cell differentiation was studied after i.p. injection of 2 μCi/g labeled thymidine to 30 male mice sacrificed at periods of 1-144 hr following injection. Stacks of rough endoplasmic reticulum cisternae appeared as differentiation proceeded, with the granules becoming progressively more numerous and larger and the nucleus acquiring an irregular shape. Labeled mature Paneth cells were observed by 5 days after injection. Unlike other types of small intestinal epithelial cells, Paneth cells did not migrate up to the villus epithelium and were thus not lost through the extrusion zone. Instead, they underwent degeneration in the crypt-base and were eventually phagocytosed by an adjacent crypt-base columnar cell.

0006 THE CELL CYCLE TIME IN THE RAT JEJUNAL MUCOSA.

(E.) Al-Dewachi, H. S.; Wright, N.

A.; Appleton, D. R.; Watson, A. J. (Dep. Pathol., Univ. Newcastle upon Tyne, England). *Cell Tissue Kinet.* 7(6):587-594, 1974.

The cell cycle time as determined from curves of percent labeled mitoses was studied in different layers of the jejunal crypt mucosa of male albino Wistar rats injected i.p. previously with ^{3}H-thymidine. For the whole crypt, the mean cycle duration was 11.32 hr and the mean duration of the DNA synthetic phase was 6.49 hr. Cells in the bottom 8 layers showed significantly prolonged cell cycle (12.34 to 15.48 hr) and DNA synthetic phase (7.14 to 8.56 hr) durations. The cell cycle parameters in the remaining cell layers did not differ significantly; the mean cell cycle and DNA synthetic phase durations were close to 11 and 6 hr, resp., with a relatively narrow distribution. The results indicate that the fall in proliferative indices seen toward the top cell layers of the crypt is not due to prolongation of the cell cycle duration as previously suggested but is fully consistent with the slow cut-off model.

0007 THE STRUCTURE OF RAT LIVER MITOCHONDRIA: A REEVALUATION. *(E.)* Brandt, J. T.; Martin, A. P.; Lucas, F. V.; Vorbeck, M. L. (Univ. Missouri Sch. Med., Columbia). *Biochem. Biophys. Res. Commun.* 59(3):1097-1103, 1974.

The liver from male Charles River rats was removed after carotid exsanguination and small sections were fixed in 2% glutaraldehyde buffered to pH 7.4 (6-8 hr) and post fixed in osmium tetroxide. The tissue was dehydrated in graded concentrations of ethanol and then embedded in Epon 812. Sections (0.08 μ) were prepared using a Porter-Blum ultramicrotome. The sections were stained with lead hydroxide and uranyl acetate and examined with a Hitachi HS-7 electron microscope. The configurations of the mitochondria observed were simple rod shapes, longer filamentous rods, V-shaped, disk-shaped, and more complex branched, tubular structures. Branching was seen in every cell examined, but branching was not observed in every mitochondrial profile. In any given section, several rod to ovoid mitochondria profiles may be part of the same mitochondrion. The variety of forms seen and the types of interrelationships observed suggest that the structure of the mitochondria may be quite plastic. Because rat liver mitochondria undergoes marked structural changes under varying nutritional states, the organization and control of intracellular structure becomes important, and a model is necessary for the study of these mechanisms and how they may relate to various physiologic and pathologic states. Studies in mitochondrial biogenesis in mammalian system which were based on the premise of a uniform population of mitochondrion relatively free in the cytoplasm should be reassessed.

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0017 THE FINE STRUCTURE OF THE NEXUS BETWEEN SMOOTH MUSCLE CELLS OF THE TAENIA COLI IN FREEZE-ETCHED REPLICAS. *(Ger.)* Geisweid, G.; Wermbter, G. (Med. Coll., Hanover, Germany). *Cytobiologie* 9(2):121-130, 1974.

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MORPHOLOGY, CELLULAR STRUCTURE AND HISTOCHEMISTRY

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0024 MORPHOMETRIC STUDY OF CELL STRUCTURE IN THE RAT LIVER DURING HORMONE INDUCTION. *(Rus.)* Khristoliubova, N. B.; Shilov, A. G.; Kiseleva, E. V.; Salganik, R. I. (Inst. Cytol. Genet., Novosibirsk, USSR). *Tsitologiia* 15(3):254-259, 1973.

0025 ALTERATIONS IN THE FINE STRUCTURE OF HEPATOCYTES IN HYPERTHYROID RATS. *(E.)* Callas, G.; Cannon, M. S. (Univ. Texas Med. Branch, Galveston). *Anat. Rec.* 181(1):71-82, 1974.

0026 STRUCTURE AND FUNCTION OF BILE CANALICULAR MICROFILAMENTS. *(E.)* Phillips, M. J.; Oda, M.; Fisher, M. M.; Jeejeebhoy, K. N. (Dep. Med., Univ. Toronto, Canada). *Am. J. Pathol.* 78(1):13a-14a, 1974.

See also, 0036, 0039, 0082, 0445, 0776.

ABSORPTION—EXCRETION—TRANSPORT

0027 THE ABSORPTION OF ^{125}I-LABELLED IMMUNOGLOBULIN G BY DIFFERENT REGIONS OF THE GUT IN YOUNG RATS. *(E.)* Morris, B.; Morris, R. (Dept. Zool., Univ. Nottingham, England). *J. Physiol. (Lond.)* 241(3):761-770, 1974.

The ability of different regions of the small intestine of young rats to absorb ^{125}I-labeled immunoglobulin G (IgG) and transmit it to the circulation was investigated. ^{125}I-labeled homologous IgG was injected into different regions of the small intestine of albino Wistar rats aged 12, 16, 18, 20, and 22 days. At 12 days the proximal and middle regions of the intestine readily absorbed globulin and transmitted it to the circulation. The distal region of the intestine transmitted little to the circulation at all ages tested. At 16 and 18 days the ability of the middle region to transmit globulin to the circulation had declined significantly; this decline continued so that little globulin was transmitted from this region at 20 and 22 days. The proximal intestine retained the ability to transmit globulin to the circulation in significant amounts up to 20 days. There was a close negative correlation between body weight and total radioactivity of the sera of rats which had received doses of labeled globulin into the proximal and middle regions of the intestine, but no such correlation after injection into the distal intestine, suggesting a restricted throughput of radioactive material by the absorptive cells of the distal small intestine. It is probable that the labeled rat globulin injected into the distal part of the intestine was taken up by the absorptive cells and accumulated in the supranuclear vacuoles, as was polyvinyl pyrrolidone (PVP) in previous experiments. Since there was good correlation between the age of termination of antibody absorption in young rats and the age when PVP uptake ceased, it was suggested that the loss of the ability to take up substances of high molecular weight might be a factor in limiting the period of antibody absorption. Since this change in the distal intestine (that is the replacement of PVP-permeable cells by PVP-impermeable cells) does not relate to the cessation of globulin transmission, its functional significance remains to be determined.

0028 STUDIES IN VIVO AND IN VITRO OF THE TRANSFER OF RAT IgG AND RAT ALBUMEN ACROSS THE INTESTINAL WALLS OF YOUNG RATS. *(E.)* Jones, R. E. (ARC Immunol. Dep. Zool., Univ. Coll. North Wales, Bangor). *Biol. Neonate* 24(3-4):220-229, 1974.

In vivo and *in vitro* studies of the transfer of rat immunoglobulin G (IgG) and rat albumin across the walls of the small intestine were performed. Equal amounts (500 μg) of rat ^{125}I-albumin and ^{131}I-IgG in physiological saline were fed together to Wistar rats at 3, 14, and 24 days of age, followed by sacrifice 3 hr later. The concentration quotients (cpm/ml of serum divided by cpm/ml of fed dose) for labeled albumin and labeled IgG were about the same in the 3-day-old rats and indicated fairly free absorption of the proteins into the circulation. In 14-day-old rats the concentration quotient for the transmission of IgG was about 20 times higher than for rat albumin. In 24-day-old rats insignificant amounts of either protein were found in the sera. Washes taken from the small intestine 30 min after feeding were subjected to centrifugation and gel filtration on Sephadex G-100 and indicated that 64% (measured planimetrically) of the ^{131}I activity in 3-day-old rats was from whole IgG molecules, while only 21% of the ^{125}I counts corresponded to undegraded albumin. Washes from 14-day-old rats indiccated that 78% of the breakdown products were present from ^{125}I-labeled albumin, whereas the bulk of the ^{131}I activity was still associated with substantially undegraded IgG. Proteolysis had proceeded much further in the lumen of the 24-day-old rats, with only 7 and 13% of the total activities corresponding to undegraded albumin and immunoglobulin G, resp. *In vitro* studies with everted sacs prepared from the proximal, mid, and distal third regions of the small intestine of 14- and 23-day-old rats indicated that for both age groups the ^{125}I- and ^{131}I-labeled proteins were transported intact and in considerable quantities across the whole of the small intestine. The transference of both proteins occurred most actively across the mid sections.

0029 EFFECT OF VITAMIN D DEFICIENCY ON AMINOACIDURIA AND INTESTINAL TRANSPORT OF AMINO ACIDS IN THE RAT. *(E.)* Morin, C. L.; Leveille, J.; Ling, V. (St. Justine Hosp., Montreal, Canada). *Can. J. Physiol. Pharmacol.* 52(5):972-977, 1974.

Studies over a 16-wk period to induce hyperaminoaciduria in 120 male weanling Holtzman rats maintained on 2 pelleted semisynthetic vitamin D deficient diets differing only by their calcium content (0.4 and 0.04% by weight) were performed to investigate the possibility of a concomitant defect in intestinal transport of amino acids. Animals with vitamin D deprivation developed progressive hypocalcemia, with the condition being most severe for rats on a low calcium diet. Phosphorus excretion was greater from the 2nd week onwards in animals on vitamin D-deficient low calcium diets than in controls. Vitamin D-deprived animals receiving normal calcium amounts developed higher phosphorus excretions than controls from the 6th week onwards. Despite signs of secondary hyperparathyroidism, generalized hyperaminoaciduria was not observed in any of the groups. Increased urinary excretion of lysine and taurine was observed, however, in rats fed a low calcium diet without vitamin D. The same observation was also made for taurine in rats deprived of vitamin D and on a normal calcium diet as well as for animals fed a low calcium diet with vitamin D. The administration of calcium gluconate (4 mg/8 hr i.p. for 3 days) and vitamin D$_2$ (10,000 U/day i.m. for 2 consecutive days) to 3 of the rats on low calcium, vitamin D-deficient diets did not result in different intracellular accumulations of L-lysine, cycloleucine, and L-alanine as compared to values measured for the remainder of the group. The experiments thus failed to show any effect of vitamin D deficiency, hypocalcemia, or secondary hyperparathyroidism on the intestinal transport of amino acids.

0030 JEJUNAL ABSORPTION OF AN AMINO ACID MIXTURE SIMULATING CASEIN AND AN ENZYMIC HYDROLYSATE OF CASEIN PREPARED FOR ORAL ADMINISTRATION TO NORMAL ADULTS. *(E.)* Silk, D. B. A.; Clark, M. L.; Marrs, T. C.; Addison, J. M.; Burston, D.; Matthews, D. M.; Clegg, K. M. (St. Bartholomew's Hosp., London, England). *Br. J. Nutr.* 33(1):95-100, 1975.

An intestinal perfusion technique utilizing a double-lumen cuffed tube in the jejunum was used in 6 normal human volunteers to study absorption of 16 amino acids from an amino acid mixture simulating casein and from an enzymatic hydrolysate of casein consisting of 50% oligopeptides and 50% free amino acids. Amino acid absorption was estimated by determining those remaining in the perfusate using ion-exchange chromatography. There was considerable variation in the extent of absorption of individual amino acids from the amino acid solution with methionine, leucine, and isoleucine being well-absorbed and threonine and histidine being extremely poorly absorbed. Amino acids were much more uniformly and extensively absorbed from the casein hydrolysate with phenylalanine, alanine, tyrosine, serine, aspartic acid, threonine and histidine being absorbed to a greater extent than from the amino acid mixture. Total absorption of α-amino nitrogen was 29% greater from the casein hydrolysate (40.3%) than from the equivalent amino acid solution (31.2%). These results indicate that administration of protein hydrolysates rather than amino acid mixtures may be nutritionally preferable in patients with extensive resections or malabsorption.

0031 ACTIVE TRANSPORT OF L-ASCORBIC ACID IN THE HUMAN ILEUM. *(E.)* Stevenson, N. R. (Rutgers Med. Sch., Piscataway, N.J.). *Gastroenterology* 67(5):952-956, 1974.

L-Ascorbic acid was absorbed by an independent Na$^+$-dependent active transport mechanism in ileal tissue taken from the human intestine. Tissue uptake studies demonstrated absorption against a gradient and a requirement for cellular energy as demonstrated by the large inhibition (86%) observed in the presence of the metabolic inhibitor, 2,4-dinitrophenol. A requirement for sodium was demonstrated in 2 ways. Ouabain, an inhibitor of the Na$^+$-K$^+$-dependent ATPase, caused a substantial inhibition (54%) of ascorbic acid accumulation, as did the partial replacement of Na$^+$ by either K$^+$ (65%) or Tris$^+$ (71% inhibition). The observation that glucose enhanced ascorbic acid transport (41%), presumably by acting as an energy metabolite, rather than inhibiting it, would appear

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to indicate that L-ascorbic acid does not use the monosaccharide transport system. Phlorizin, a competitive inhibitor of monosaccharide transport, added in a concentration sufficient to block essentially all glucose uptake, was observed to cause partial inhibition of ascorbic acid transport (45%). This is attributed to phloretin release by phlorizin hydrolase, and thus provides additional indication of the energy requirement of this transport system. Thus, L-ascorbic acid is absorbed by a Na$^+$-dependent active transport mechanism in man which is similar to that in the guinea pig.

0032 UPTAKE AND METABOLISM OF PLASMA GLUTAMINE BY THE SMALL INTESTINE. *(E.)* Windmueller, H. G.; Spaeth, A. E. (Natl. Inst. Health, Bethesda, Md.). *J. Biol. Chem.* 249(16):5070-5079, 1974.

Measurements were made of the net uptake of glutamine by isolated perfused rat intestine. Preparations extracted large amounts of glutamine (75 μM/hr) but no other amino acids from a recirculated blood perfusate. With L-[U-^{14}C]glutamine, the carbon was partly incorporated into tissue acid-insoluble material (14%) and the rest reappeared with little delay in intestinal venous blood in CO$_2$ (57%), citrulline (6%), proline (5%), and organic acids (18%), predominantly citric acid and lactic acid. Perfusate glutamine was the source of 32% of the CO$_2$ produced by the preparation, although the perfusate contained 10 to 15 mM glucose. Most glutamine uptake and metabolism occurred in the small intestinal mucosal cells and, from analyses of labeled tissue metabolites, appeared to proceed *via* glutamic acid. The rapid flow of glutamine carbon through mucosa may be explained in part by the small glutamine pool, only 0.2 μM/g of tissue. Glutamine nitrogen taken up by intestine could be approximately accounted for by the quantities of citrulline (34%), alanine (33%), ammonia (23%), and proline (10%) released back into the perfusate. Glutamine uptake comparable to that found in the isolated organ was observed *in vivo*, from arteriovenous concentration measurements across intestine in fasted dogs, cats, hamsters, monkeys, and conventional and germ-free rats. Twenty-five to 33% of plasma glutamine was extracted in each pass through the tissue. Glutamine uptake persisted in rats during transport of large amounts of glutamic acid from the intestinal lumen into the blood and in rats injected with 6-diazo-5-oxo-L-norleucine, a glutamine analog (65 mg/kg). The results of these studies suggest that glutamine derived from blood is an important respiratory substrate for cells in the small intestinal mucosa and that intestine is a major site for metabolism of glutamine released into the circulation by other tissues.

0033 CHARACTERISTICS OF SODIUM FLUX FROM SEROSA TO MUCOSA IN RAT ILEUM. *(E.)* Desjeux, J. F.; Tai, Y. H.; Curran, P. F. (Yale Univ. Sch. Med., New Haven, Conn.). *J. Gen. Physiol.* 64(3):274-292, 1974.

Sodium flux from serosa to mucosa in rabbit ileum *in vitro* was studied as a function of applied electrical potential at equal sodium concentrations in the bathing solutions. Pieces of distal ileum, stripped of their serosal and muscle layers, were mounted as flat sheets between two Lucite half-chambers which were connected to jacketed reservoirs of bathing solution maintained at 37 C. The bathing solutions were connected *via* agar bridges to calomel electrodes for measurement of potential difference and to silver-silver chloride electrodes for passing current through the tissue. Isotopes and pharmacological agents when used were added to the bathing solutions immediately after mounting the tissue. The sodium flux from serosa to mucosa appeared to involve two pathways: a diffusional flux through a paracellular shunt pathway and a flux that was independent of applied potential and presumably involved a transcellular pathway. The latter pathway comprised approximately 25% of the sodium flux from serosa to mucosa in Ringer's solution containing 10 mM glucose and 25 mM bicarbonate. This presumably transcellular pathway was stimulated significantly by theophylline, unaffected by removal of glucose or the addition of ouabain, and reduced to negligible values of sodium flux by anoxia, 2,4-dinitrophenol, and replacement of all chloride and bicarbonate by isethionate. This component of sodium flux from serosa to mucosa thus demonstrated a number of characteristics consistent with involvement in a specific secretory process mediating an electrically neutral secretory transport of sodium plus anion from serosa to mucosa. Theophylline, in addition to stimulating this process, significantly reduced the permeability of the paracellular shunt pathway to sodium.

0034 BLOCKAGE OF CATION PERMEABILITY ACROSS THE TIGHT JUNCTIONS OF GALLBLADDER AND OTHER LEAKY EPITHELIA. *(E.)* Moreno, J. H. (Univ. California Med. Cent., Los Angeles). *Nature* 251(5471): 151, 1974.

The protonated form of the organic base 2,4,6-triaminopyrimidine (TAP) was used to reversibly and specifically block cation permeation across the tight junction route (between cells) of the frog gallbladder and several other leaky epithelia. Transepithelial electrical potential differences and conductances were measured across flat sheets of bullfrog gallbladder mounted between 2 well-stirred chambers at 23 C, and the rate of fluid transport was measured in sac preparations of bullfrog gallbladder by a gravimetric procedure. Addition of TAP was to both the mucosal and serosal sides of the preparation and invariably increased the membrane resistance and decreased the sodium to chloride permeability ratio due to a specific decrease in sodium conductance. The pyrimidine did not affect chloride conductance, indicating that sodium and chloride migrate through separate pathways and that the chloride pathway is a relatively small parallel leakage or free solution shunt. In 5 other leaky epithelia (6 rabbit gallbladders, 2 Necturus gallbladders, 2 rabbit small intestines, 2 bullfrog small intestines, and 2 bullfrog choroid plexuses), TAP had qualitatively the same effect as in frog gallbladder. The rate of isotonic solution transport, which measures and is caused by active transport of sodium from the mucosal to the serosal solutions, in the absence of sodium bicarbonate in the bathing solutions was 3.9 μl/hr/

cm^2 in 6 frog gallbladders and, after addition of 10 mM TAP, 3.8 μl/hr/cm^2. When 7 mM NaHCO$_3$ (which stimulates active transport) was included in the bathing solutions, the rate of transport increased to 9.8 in controls and to 9.9 μl/hr/cm^2 in the presence of 10 mM TAP. Thus, TAP at a concentration which blocks 80% of the transepithelial sodium conductance does not seem to interfere with active sodium transport or to affect bicarbonate stimulation of transport. Gallbladder TAP in the frog appears to act specifically in the cation-selective ion channels of the tight junction responsible for the passive sodium permeability without affecting either the small chloride leakage current or the active sodium transport.

0035 INHIBITION OF IRON ABSORPTION IN MAN BY TETRACYCLINE. *(Ger.)* Heinrich, H. C.; Oppitz, K. H.; Gabbe, E. E. (Univ. Hosp. Eppendorf, Univ. Hamburg, Germany). *Klin. Wochenschr.* 52(10): 493-498, 1974.

The inhibition of iron absorption by tetracycline was studied in humans. A therapeutic 500 mg dose of tetracycline (Hostacyclin), combined with ^{59}Fe-labeled bivalent ion cations in the form of a 50 mg therapeutic dose of iron sulfate in aqueous solution, was administered orally to subjects with normal and depleted iron reserves. The patients were fasted for 10 hr before and 2 hr after administration. The whole body retention of absorbed ^{59}Fe was measured within the 4π counting geometry of a large-volume radioactivity detector by means of a liquid organic scintillator. When administered simultaneously with iron, tetracycline reduced iron absorption from 7.9 to 1.6%, corresponding to an inhibition of 78% in subjects with normal iron reserves, and from 15 to 5.4%, corresponding to an inhibition of 65%, in subjects with depleted iron reserves. When tetracycline and iron were administered simultaneously but in separate capsules, tetracycline inhibited iron absorption by 32 in subjects with normal iron reserves, and by 40 in subjects with depleted iron reserves. The findings indicate that tetracycline is a potent inhibitor of iron absorption due to the formation of stable, sparingly absorbable iron-tetracycline chelates through inhibition or total suppression of the biosynthesis of carrier proteins responsible for the control of iron absorption. During tetracycline therapy, iron and other bivalent metallic cations should never be administered concomitantly. However, an interval of 3 hr is sufficient to avoid drug interaction with iron.

0036 ELECTRICAL IMPEDANCE, ULTRASTRUCTURE AND ION TRANSPORT IN FOETAL GASTRIC MUCOSA. *(E.)* Wright, G. H. (Dep. Physiol., Bedford Coll., London, England). *J. Physiol. (Lond.)* 242(3):661-672, 1974.

0037 THE K$^+$-STIMULATED ATPase SYSTEM OF MICROSOMAL MEMBRANES FROM GASTRIC OXYNTIC CELLS. *(E.)* Forte, J. G.; Ganser, A. L.; Tanisawa, A. S. (Dep. Physiol. Anat., Univ. California, Berkeley). *Ann. NY Acad. Sci.* 242:255-267, 1974.

0038 INVESTIGATIONS INTO THE EFFECT OF PRENYLAMINE ON ABSORPTION IN HUMAN SMALL INTESTINE. *(Ger.)* Gottesburen, H.; Raida, H.; Riecken, E. O. (Med. Clin., Univ. Marburg/Lahn, Germany). *Dtsch. Med. Wochenschr.* 99(42):2104-2105, 1974.

0039 EFFECT OF LANTHANUM AND SITS (4-ACETAMIDO-4'-ISOTHIOCYANOSTILBENE-2,2'-DISULFONIC ACID) ON IONIC SELECTIVITY OF THE PROXIMAL INTESTINE IN Rana esculenta. *(It.)* Schettino, T.; Curci, S.; Lippe, C. (Inst. Gen. Physiol., Univ. Bari, Italy). *Boll. Soc. Ital. Biol. Sper.* 49(18 bis):no. 74, 1973.

0040 STUDIES ON DRUG NONEQUIVALENCE. I. THERMODYNAMIC PARAMETERS AND INTESTINAL ABSORPTION OF POLYMORPHS OF GLUTATHIONE. *(E.)* Kuroda, K.; Nomura, T. (Kobe Univ. Hosp., Japan). *Kobe J. Med. Sci.* 20(2):47-54, 1974.

0041 THE EFFECT OF PINEALECTOMY ON INTESTINAL ABSORPTION OF GLYCINE IN THE GROWING RAT. *(Fr.)* Peres, G. E.; Vareilles, F. (Univ. Med., Clermont-Ferrand, France). *C. R. Soc. Biol. (Paris)* 168(1):54-58, 1974.

0042 INTESTINAL ABSORPTION OF TRYPTOPHAN STEREOISOMERS AND ANALOGS. *(E.)* Bosin, T. R.; Hathaway, D. R.; Maickel, R. P. (Med. Sci. Program, Indiana Univ., Bloomington). *Arch. Int. Pharmacodyn.* 212(1):32-35, 1974.

0043 STUDIES ON THE UPTAKE OF GLYCYL-L-LEUCINE BY STRIPS OF MONKEY SMALL INTESTINE. *(E.)* Das, M.; Radhakrishnan, A. N. (Christ. Med. Coll. Hosp., Vellore, India). *Indian J. Biochem. Biophys.* 11(1):12-16, 1974.

0044 INTESTINAL TRANSFER OF BIVALENT CATIONS: EFFECTS ON THE ABSORPTION OF ^{45}Ca OF INCREASING DOSES OF L-ARABINOSE INGESTED SIMULTANEOUSLY WITH THIS MINERAL. *(Fr.)* Fournier, P.; Dupuis, Y. (Fac. Sci. Pharm. Biol., Chatenay-Malabry, France). *C. R. Acad. Sci.* [*D*] *(Paris)* 278(24):3107-3110, 1974.

0045 ROLE OF GASTRIC ACID IN THE UTILIZATION OF DIETARY CALCIUM BY THE RAT. *(E.)* Mahoney, A. W.; Hendricks, D. G. (Nutr. Food Sci., Utah State Univ., Logan). *Nutr. Metab.* 16(6):375-382, 1974.

0046 STIMULATION OF CALCIUM ABSORPTION AND APPARENT INCREASED INTESTINAL 1,25-DIHYDROXYCHOLECALCIFEROL IN RATS TREATED WITH LOW DOSES OF ETHANE-1-HYDROXY-1,1-DIPHOSPHONATE. *(E.)* Guilland, D.; Trechsel, U.; Bonjour, J. P.; Fleisch, H. (Dep. Pathophysiol., Univ. Bern, Switzerland). *Clin. Sci. Mol. Med.* 48(2):157-160, 1975.

0047 FACULTATIVE CONTROL OF INTESTINAL CALCIUM ABSORPTION. *(E.)* Cramer, C. F. (Dep. Physiol., Univ. British Columbia, Vancouver, Canada). *Rend. Gastroenterol.* 6(2):132-138, 1974.

0048 RELATIONSHIP BETWEEN CADMIUM AND IRON ABSORPTION. *(E.)* Hamilton, D. L.; Valberg, L. S. (Dep. Med., Queen's Univ., Kingston, Canada). *Am. J. Physiol.* 227(5):1033-1037, 1974.

0049 IRON ABSORPTION AND TOLERANCE TEST IN IRON DEFICIENCY. *(Sp.)* Sottano de Russo, E. Y.; Marsano, O.; Arroyo, N. (Fac. Med. Sci., Univ. Natl. Cordoba, Argentina). *Rev. Assoc. Bioquim. Argent.* 38(209/210):284-287, 1973.

0050 INTERACTION OF TRANSFERRIN WITH IRON-BINDING SITES ON RAT INTESTINAL EPITHELIAL CELL PLASMA MEMBRANES. *(E.)* Evans, G. W.; Grace, C. I. (Agric. Res. Serv., U.S. Dep. Agric., Grand Forks, N.D.). *Proc. Soc. Exp. Biol. Med.* 147(3): 687-689, 1974.

0051 EFFECT OF DIETARY IRON MANIPULATION AND PHENOBARBITONE TREATMENT ON IN VIVO INTESTINAL ABSORPTION OF IRON IN MICE WITH SEX-LINKED ANEMIA. *(E.)* Edwards, J. A.; Hoke, J. E. (Dep. Med., State Univ. New York, Buffalo). *Am. J. Clin. Nutr.* 28(2):140-145, 1975.

0052 DEPENDENCE OF INCREASED IRON ABSORPTION BY IRON-DEFICIENT RATS ON AN ELUTABLE COMPONENT OF JEJUNAL MUCOSA. *(E.)* Huebers, H.; Huebers, E.; Rummel, W. (Inst. Pharmacol. Toxicol., Univ. Saarland, Homburg/Saar, Germany). *Hoppe Seylers Z. Physiol. Chem.* 355(9):1159-1161, 1974.

0053 EFFECT OF GLUCAGON ON RADIOCALCIUM EXCRETION BY THE COLON IN RATS AFTER INTRACARDIAL ADMINISTRATION OF ^{45}Ca. *(E.)* Bogdal, J.; Jedrychowski, A.; Tarnawski, A.; Dura, K.; Marszalek, Z. (Med. Acad. Krakow, Poland). *Can. J. Physiol. Pharmacol.* 52(6): 1230-1232, 1974.

0054 THE EFFECT OF ALUMINUM CHLORIDE ON ^{45}Ca FLUXES IN ISOLATED LONGITUDINAL SMOOTH MUSCLE FROM RAT COLON. *(E.)* Hava, M.; Hurwitz, A. (Univ. Kansas Med. Cent., Kansas City). *Arch. Int. Pharmacodyn.* 212(1):24-31, 1974.

0055 ABSORPTION OF IRON. HUMORAL FACTORS AND HEPATIC DEPOSITION. *(Sp.)* Sottano de Russo, E. Y.; Itoiz, J. E.; Arroyo, N. (Fac. Med. Sci., Univ. Natl. Cordoba, Argentina). *Rev. Assoc. Bioquim. Argent.* 38(209/210):288-291, 1973.

0056 TRANSFERRIN AND IRON UPTAKE BY THE LIVER IN THE RAT. *(E.)* Gardiner, M. E.; Morgan, E. H. (Dep. Physiol., Univ. West. Australia, Nedlands). *Aust. J. Exp. Biol. Med. Sci.* 52(5):723-736, 1974.

0057 THE PASSIVE TRANSPORT OF POTASSIUM IN RAT LIVER CELLS. *(E.)* Mazet, J. L.; Claret, M.; Claret, B. (Lab. Comp. Physiol., Natl. Sci. Res. Cent., Orsay, France). *J. Membr. Biol.* 18(3/4):335-350, 1974.

0058 INHIBITORY EFFECT OF PROSTAGLANDINS ON ISOSMOTIC FLUID TRANSPORT BY RABBIT GALLBLADDER IN VITRO, AND ITS MODIFICATION BY BLOCKADE OF ENDOGENOUS PGE-BIOSYNTHESIS WITH INDOMETHACIN. *(E.)* Leyssac, P. P.; Bukhave, K.; Frederiksen, O. (Univ. Inst. Exp. Med., Copenhagen, Denmark). *Acta Physiol. Scand.* 92(4):496-507, 1974.

0059 UDP GLUCURONYLTRANSFERASE AND PHENOLSULFOTRANSFERASE FROM RAT LIVER IN VIVO AND IN VITRO. CHARACTERIZATION OF CONJUGATION AND BILIARY EXCRETION OF HARMOL IN VIVO AND IN THE PERFUSED LIVER. *(E.)* Mulder, G. J.; Hayen-Keulemans, K.; Sluiter, N. E. (Dep. Pharmacol., State Univ. Groningen, Netherlands). *Biochem. Pharmacol.* 24(1):103-107, 1974.

0060 PARTICIPATION OF Na,K-DEPENDENT ATPase IN THE ACTION MECHANISM OF OXYTOCIN IN ISOTONIC FLUID TRANSPORT IN THE GALLBLADDER EPITHELIUM. *(Rus.)* Iaremenko, M. S.; Butusova, I. A.; Kharlamova, O. N. (A. A. Bohomolets Inst. Physiol., Kiev, USSR). *Fiziol. Zh. SSSR* 60(10):1592-1596, 1974.

See also, 0012, 0149, 0322.

MOTILITY

0061 INTERACTION OF PENTAGASTRIN AND THE OCTAPEPTIDE OF CHOLECYSTOKININ ON THE HUMAN LOWER OESOPHAGEAL SPHINCTER. *(E.)* Sturdevant, R. A. L.; Kun, T. (VA Wadsworth Hosp., Los Angeles, Calif.). *Gut* 15(9):700-702, 1974.

Seven adult male volunteers without clinical evidence of gastric or esophageal disease were studied with motility tube assemblies to determine if infusion of the octapeptide of cholecystokinin inhibits the response of the lower esophageal sphincter to pentagastrin. After positioning of the motility tube assembly, an i.v. infusion of either 154 mM sodium chloride or cholecystokinin (40 ng/kg/hr) was begun, with lower esophageal sphincter pressure being recorded for 10 min. Pentagastrin was then given through a 3-way stopcock attached to the infusion in doses of 0.05, 0.1, 0.2, 0.4, and 0.6 µg/kg (over 30 sec at 10 min intervals in random order). Lower esophageal sphincter pressure was recorded as the mean of end-inspiratory and end-expiratory pressures in mm Hg greater than intragastric pressure. The octapeptide of cholecystokinin infusion did not significantly decrease basal lower esophageal sphincter pressure but partially inhibited the response to pentagastrin. The inhibition was significant for 0.1, 0.2 and 0.4 µg/kg doses, with the mean peak lower esophageal sphincter pressure in mm Hg decreasing from about 30 to 20, 25 to 20, and 35 to 25, resp. The data did not fit Michaelis-Menten kinetics sufficiently well to determine if the inhibition was competitive or not. In contrast, bolus injections of octapeptide of cholecystokinin (5 ng/kg and 20 ng/kg) to 3 of the same subjects lowered the lower esophageal sphincter pressure from 15.3 mm Hg before injection to 9.5 and 2.2 mm Hg, resp. after injections. This action was inhibited by a background infusion of 0.5 µg/kg/hr of pentagastrin such that the lower esophageal sphincter pressures after the bolus injections of 5 ng/kg and 20 ng/kg octapeptide of cholecystokinin were 17 and 7.3 mm Hg. The results confirm the view that gastrin and cholecystokinin have pharmacological effects on lower esophageal sphincter pressure, though their roles, if any, in its physiological control are not established. If gastrin is not involved in regulation of basal lower esophageal sphincter pressure, then the decrease in lower esophageal sphincter pressure produced by bolus injection of octapeptide of cholecystokinin cannot be explained by inhibition at a postulated cholecystokinin-gastrin receptor. This action could be due to direct activation of an inhibitory receptor rather than to blocking of a stimulatory receptor.

0062 MECHANISM OF THE INHIBITORY ACTIONS OF SOME SPASMOGENS ON THE BRADYKININ RELAXATION OF THE GUINEA-PIG ILEUM.

(E.) Hall, D. W. R.; Bonta, I. L.; Verhoef, E. R. (Med. Fac., Erasmus Univ., Rotterdam, Netherlands). *Eur. J. Pharmacol.* 25(2):308-315, 1974.

The effects of various intestinal spasmogens on bradykinin-induced relaxation of guinea-pig ileum were studied in isolated preparations. Increasing doses of histamine (20-200 ng/ml) and eledoisin (10-200 ng/ml) to concentrations exceeding their maximal effect showed increasing abilities to inhibit bradykinin (2 ng/ml)-induced small bowel relaxation, although high concentrations were less effective than previously reported effects of high concentrations of acetylcholine. Angiotensin (4-100 ng/ml) treatment showed no such dose-response relationship although low non-spasmogenic doses in the presence of acetylcholine-induced contraction did reduce bradykinin relaxation. Both morphine (10 ng/ml) and atropine (1 ng/ml) blocked 1,1-dimethyl-4-phenylpiperazinium iodide-induced (1 µg/ml) small bowel contractions by 77.4% and 45.4% resp. Both substances also significantly reduced angiotensin-induced contraction and potentiated bradykinin-induced relaxation in the presence of angiotensin. Morphine had no effect whereas atropine (0.5 ng/ml) partially blocked acetylcholine-induced small bowel contraction. Neither morphine nor atropine had any effect on bradykinin reduction of its own relaxation response on acetylcholine-treated ileum. Thus, the magnitude of the bradykinin relaxation on guinea-pig ileum depends on the manner of stimulation rather than on the state of contraction and is sensitive to regulation by parasympathomimetic agents. Angiotensin reduces bradykinin-induced relaxation *via* a mechanism which involves its indirect parasympathomimetic effects. However, bradykinin reduction of its own relaxing effect is most probably by direct action rather than *via* a parasympathetic mechanism.

0063 INTERACTION BETWEEN SEROTONIN AND MORPHINE IN THE GUINEA-PIG ILEUM.

(E.) Gintzler, A. R.; Musacchio, J. M. (New York Univ. Med. Ctr., N.Y.). *J. Pharmacol. Exp. Ther.* 189(2):484-492, 1974.

The effect of 5-hydroxytryptamine on morphine-induced inhibition of electrically induced concentrations of terminal guinea-pig ileum was studied *in vitro*. 5-Hydroxytryptamine (2×10^{-8} to 2×10^{-7}M) produced a 2- to 3-fold increase in the degree of inhibition of ileum contraction by morphine (2×10^{-8}M). Conversely, pretreatment with small concentrations of morphine (5×10^{-9} to 10^{-8}M) potentiated the inhibitory response of ileum to 5-hydroxytryptamine (4×10^{-7}M) by about 3-fold. The potentiating effect of 5-hydroxytryptamine was also observed for nalorphine (4-fold) and methadone (2-fold) but not for norepinephrine (10^{-8}M). Norepinephrine had no effect on morphine-induced inhibition of contraction. Lysergic acid diethylamide (0.1 µg/ml) antagonized the inhibitory effects of 5-hydroxytryptamine and produced a 2-fold potentiation of the morphine effect. These results suggest that the interaction between morphine and 5-hydroxytryptamine is specific and that 5-hydroxytryptamine may mediate the effects of morphine on the small intestine.

0064 THE EFFECTS OF HUMAN- AND ANIMAL-PATHOGENIC COLI STRAINS ON THE ISOLATED INTESTINE OF RABBIT.

(Ger.) Metz, H.; Bonu, D.; Ohgke, H. (Max von Pettenkofer Inst. Hyg. Med. Microbiol., Univ. Munich, Germany). *Zentralbl. Bakteriol.* [*Orig. A*] 226(2):215-223, 1974.

The effect of human- and animal-pathogenic coli strains on the motility of the isolated, sacciform prepared ileum of rabbit was studied. The addition of enteropathogenic coli bacteria induced characteristic changes in the rhythms of the contractions of the ileum in Krebs-Henseleit solution as recorded on kymograph drum. This effect was found among O types of *E. coli* pathogenic for infants (*E. coli* O 55 and O 111 strains) in 139 out of 276 experiments, and among O types of swine enteritis or swine edema disease (O 8, O 138, O 149, and O 139 strains) in 59 out of 64 experiments. Heat treatment at 100 C and aging of the cultures did not influence the results. Sodium chloride suspensions of bacteria cultured on solid medium had a significantly lower effect. Non-pathogenic coli strains did not influence the motility of the ileum preparations. The disturbance in the motility rhythm of the ileum was induced by the lipopolysaccharide-free supernatant of ultrasonic homogenates rather than by the lipopolysaccharides of the bacteria. The results indicate the possible existence of a protein-like enterotoxin causing coli-enteritis in infants and young pigs.

0065 THE ACTION MECHANISM OF RESTRAINT ON GASTRIC EMPTYING IN THE RAT. III. ROLE OF THE ADRENAL GLANDS. *(Fr.)* Dumas, J.; Peres, G. (Lab. Gen. Compar. Physiol., Univ. Lyon, France). *C. R. Soc. Biol. (Paris)* 168(1):47-50, 1974.

0066 EFFECT OF PENTAGASTRIN ON THE LOWER ESOPHAGEAL SPHINCTER: AN ANIMAL EXPERIMENT. *(Ger.)* Kunath, U.; Hollevoet, J. (Surg. Cent., Johann Wolfgang Goethe Univ., Frankfurt/Main, Germany). *Langenbecks Arch. Chir.* 336(3):235-246, 1974.

0067 EFFECT OF TEMPERATURE ON ELECTRICAL ACTIVITY IN THE STOMACH AND DUODENUM OF ANESTHETIZED RATS. *(Fr.)* Medici, A.; Morelle, O.; Thouvenot, J. (Lab. Physiol., UER Med., Univ. Tours, France). *C. R. Soc. Biol. (Paris)* 168(2/3):326-330, 1974.

0068 EFFECT OF ACTH (CORTROSYN-DEPOT) ON ELECTROMYOGRAMS ON STOMACH AND SMALL INTESTINES. *(E.)* Milenov, K. T.; Nikolov, N. A.; Kasakov, L. N. (Bulgarian Acad. Sci., Sofia). *Dokl. Acad. Nauk (Bulg.)* 27(8):1149-1152, 1974.

0069 DEVELOPMENT OF TOLERANCE TO THE STIMULATORY EFFECT OF MORPHINE IN DOG INTESTINE. *(E.)* Burks, T. F.; Jaquette, D. L.; Grubb, M. N. (Univ. Texas Med. Sch., Houston). *Eur. J. Pharmacol.* 25(2):302-307, 1974.

0070 SITES OF ACUTE MORPHINE TOLERANCE IN INTESTINE. *(E.)* Burks, T. F.; Grubb, M. N. (Univ. Texas Med. Sch., Houston). *J. Pharmacol. Exp. Ther.* 191(3):518-526, 1974.

0071 SOME EFFECTS OF DIPYRIDAMOLE, HEXOBENDINE AND LIDOFLAZINE IN INHIBITORY PROCESSES IN RABBIT DUODENUM. *(E.)* Hulme, M. E.; Weston, A. H. (Dep. Pharmacol., Univ. Manchester, England). *Br. J. Pharmacol.* 50(4):609-611, 1974.

0072 STRUCTURE-ACTIVITY RELATIONSHIP OF NATURAL AND SEMI-SYNTHETIC GENINS AND GLYCOSIDES AS INVESTIGATED ON THE SMOOTH MUSCLE OF THE GUINEA-PIG ILEUM. *(E.)* Haustein, K. O.; Megges, R.; Hauptmann, J. (Med. Acad. Erfurt, Germany). *Pharmacology* 10(2):65-75, 1973.

0073 MODULATING ROLE OF PROSTAGLANDINS IN CONTRACTIONS OF THE GUINEA-PIG ILEUM. *(E.)* Kadlec, O.; Masek, K.; Seferna, I. (Inst. Pharmacol., Prague, Czechoslovakia). *Br. J. Pharmacol.* 51(4): 565-570, 1974.

0074 PARTICIPATION OF HORMONAL FACTORS IN THE REGULATION OF MOTOR ACTIVITY IN THE DUODENUM. *(Rus.)* Fokina, A. A.; Slobozhankin, A. D.; Solovieva, I. A. (I. P. Pavlov Inst. Physiol., Leningrad, USSR). *Fiziol. Zh. SSSR* 60(11):1703-1710, 1974.

0075 CHARACTERISTICS OF INTESTINAL MOTOR ACTIVITY FROM BALLONOGRAPHIC FINDINGS AND RECORDINGS OF LUMINAL PRESSURE WITH AN OPEN CATHETER. *(Rus.)* Galperin, Iu. M.; Popova, T. S. (N. V. Sklifosovskii Sci. Res. Inst. Emerg. Med. Treat., Moscow, USSR). *Fiziol. Zh. SSSR* 60(10):1582-1591, 1974.

0076 IN VITRO STUDY OF THE ELECTROMYOGRAPHIC ACTIVITY OF THE PROXIMAL AND DISTAL COLON IN THE RABBIT. *(Fr.)* Jule, Y. (Inst. Neurophysiol. Psychophysiol., Marseille, France). *J. Physiol. (Paris)* 68(3):305-329, 1974.

0077 EFFECT OF 6-HYDROXYDOPAMINE ON [^{3}H]-ADENINE NUCLEOTIDE AND [^{3}H]-NORADRENALINE RELEASE FROM THE GUINEA-PIG TAENIA CAECUM EVOKED BY ELECTRICAL FIELD STIMULATION, NICOTINE AND PERIVASCULAR NERVE STIMULATION. *(E.)* Kuchii, M.; Miyahara, J. T.; Shibata, S. (Sch. Med., Univ. Hawaii, Honolulu). *Br. J. Pharmacol.* 51(4):577-583, 1974.

0078 13-NORLEUCINE AND MOTILIN: ANALYSIS OF THE EFFECTS ON THE GASTROINTESTINAL TRACT. *(Ger.)* Domschke, W.; Strunz, U.; Mitznegg, P.; Ruppin, H.; Domschke, S.; Schubert, E.; Wunsch, E.; Jaeger, E.; Demling, L. (Med. Clin. Polyclin., Univ. Erlangen, Germany). *Naturwissenschaften* 61(8):370, 1974.

0079 ACTIONS OF PUTATIVE TRANSMITTERS IN THE CHICKEN VAGUS NERVE/OESOPHAGUS AND REMAK NERVE/RECTUM PREPARATIONS. *(E.)* Bartlet, A. L. (Dep. Vet. Pharmacol., Edinburgh, Scotland). *Br. J. Pharmacol.* 51(4):549-558, 1974.

See also, 0387, 0431.

SECRETION AND METABOLISM

0080 DEVELOPMENT OF THE RAT SALIVARY GLANDS. IV. AMYLASE AND RIBONUCLEASE ACTIVITY DURING EMBRYONIC AND NEONATAL DEVELOPMENT OF THE PAROTID AND SUBMAXILLARY GLANDS. *(E.)* Ball, W. D. (Dep. Zool., Univ. Washington, Seattle). *Dev. Biol.* 41(2):267-277, 1974.

0081 CIRCADIAN RHYTHMS IN THE FLOW RATE AND COMPOSITION OF UNSTIMULATED AND STIMULATED HUMAN SUBMANDIBULAR SALIVA. *(E.)* Dawes, C. (Fac. Med., Univ. Manitoba, Winnipeg, Canada). *J. Physiol. (Lond.)* 244(2):535-548, 1975.

0082 SECRETION GRANULES OF THE RABBIT PAROTID GLAND: ISOLATION, SUBFRACTIONATION, AND CHARACTERIZATION OF THE MEMBRANE AND CONTENT SUBFRACTIONS. *(E.)* Castle, J. D.; Jamieson, J. D.; Palade, G. E. (Rockefeller Univ., New York, N.Y.). *J. Cell. Biol.* 64(1):182-210, 1974.

0083 ISOLATION OF A DEOXYRIBONUCLEASE FROM BOVINE PAROTID GLAND. *(E.)* Mizutani, T.; Mizutani, A. (Fac. Pharm. Sci., Nagoya City Univ., Japan). *Chem. Pharm. Bull. (Tokyo)* 22(11):2723-2725, 1974.

0084 IMMUNOCHEMICAL ASSAY OF SALIVA PAROTIN A. *(E.)* Shinoda, M.; Takagi, Y. (Hoshi Coll. Pharm., Tokyo, Japan). *Chem. Pharm. Bull. (Tokyo)* 22(11):2732-2734, 1974.

0085 AN EFFECT OF PROSTAGLANDIN E_1 ON THE ACINAR CELL OF THE RAT PAROTID GLAND. *(E.)* Lillie, J. H. (Med. Sch., Univ. Michigan, Ann Arbor). *J. Ultrastruct. Res.* 49(1):50-59, 1974.

0086 CHANGES IN NEURONAL UPTAKE AND METABOLISM OF, AND SENSITIVITY TO, NOREPINEPHRINE DURING THE DEGENERATION SECRETION IN THE RAT SUBMAXILLARY GLAND. *(E.)* Stefano, F. J. E.; Perec, C. J.; Tumilasci. O. R. (Natl. Counc. Sci. Tech. Invest., Buenos Aires, Argentina). *J. Pharmacol. Exp. Ther.* 191(3):403-417, 1974.

0087 RECURRENT DEGRADATION BY Canavalia ensiformis GLYCOSIDASES OF A POLYSACCHARIDE MOIETY FROM A GLYCOPROTEIN ISOLATED FROM HUMAN PAROTID SALIVA. *(Fr.)* Boersma, A.; Lamblin, G.; Degand, P. (Res. Unit Protein Biochem., INSERM, Lille, France). *C. R. Acad. Sci.* [*D*] *(Paris)* 279(12):1031-1034, 1974.

0088 IN VIVO DRUG METABOLISM AFTER CHRONIC ETHANOL ADMINISTRATION: INFLUENCE OF DIETARY FAT. *(E.)* Hetu, C.; Joly, J. G. (St. Luke Hosp., Montreal, Canada). *Gastroenterology* 67(4): 798, 1974.

0089 EFFECT OF TWO VITAMIN D_3 METABOLITES, DIHYDROXY-24,25-CHOLECALCIFEROL AND DIHYDROXY-25,26-CHOLECALCIFEROL, ON THE MOST IMPORTANT PARAMETERS OF CALCIUM METABOLISM IN THE RAT. *(Fr.)* Milhaud, G.; Labat, M. L.; Redel, J. (Fac. Med., Paris, France). *C. R. Acad. Sci.* [*D*] *(Paris)* 279(10):827-830, 1974.

SECRETION AND METABOLISM

Stomach

0090 THE RELEASE OF HISTAMINE DURING GASTRIC ACID SECRETION IN CONSCIOUS RATS. *(E.)* El Munshid, H. A.; Lake, H. J. (Univ. Med. Sch., Newcastle upon Tyne, England). *J. Physiol. (Lond.)* 242(3):571-587, 1974.

Various groups of conscious gastric-cannulated adult female Wistar rats were given ^{3}H-histidine and aminoguanidine by dosage procedures intended to build up fast-turnover and slow-turnover pools of tissue ^{3}H-histamine to study histamine release during gastric acid secretion. Slow-pool turnover conditions were established by giving daily s.c. injections of ^{3}H-histidine (4 μC) and aminoguanidine (10 mg/kg) to 10 rats sacrificed at intervals over a period of 18 days, 24 hr after the final injection. The fast-turnover pool was established by giving continuous i.v. infusions of ^{3}H-histidine (4 μC/hr) and aminoguanidine (1 mg/kg/hr) to 10 rats fasted overnight. The animals were sacrificed in pairs at intervals over a 20-hr period. The amount of ^{3}H-histamine in gastric juice derived from either the slow- or fast-turnover pools was very low and was not altered during stimulation of gastric acid secretion by 3.3 μg/kg/min i.v. pentagastrin. Pentagastrin-induced urinary excretion of labeled histamine from the slow-turnover pool was abolished by gastrectomy (5 rats), and the ^{3}H-histamine liberated bv pentagastrin from this pool appeared to have been derived from the stomach. Evidence was not found for the existence of a slow-turnover histamine pool in the glandular mucosa of the stomach; thus, the source of the pentagastrin-liberated histamine within the stomach was uncertain. Pentagastrin (3.3 μg/kg/min i.v.) did not cause an increased urinary excretion of ^{3}H-histamine from the fast-turnover pool. The amount of ^{3}H-histamine excreted by gastrectomized rats was not different from that produced by gastric-cannulated animals, suggesting that a high proportion of urinary histamine derived from the fast-turnover pool was non-gastric in origin. Although the urinary output of ^{3}H-histamine was prolonged beyond the end of pentagastrin administration and gastric acid secretion in some experiments, the overall data did not suggest that urinary histamine output and gastric acid secretion take different time courses.

0091 THE ROLE OF HISTAMINE RECEPTORS IN THE STIMULATION OF GASTRIC ACID SECRETION.

(E.) Konturek, S. J.; Demitrescu, T.; Radecki, T. (Inst. Physiol., Med. Acad., Krakow, Poland). *Am. J. Dig. Dis.* 19(11):999-1006, 1974.

In 7 conscious cats provided with chronic gastric fistulas 6 months previously, metiamide, an H_2-receptor antagonist, when given in a dose of 12 μM/kg/hr, inhibited gastric acid output stimulated maximally with histamine by 70%, pentagastrin by 55%, cerulein by 75%, insulin by 67%, urecholine by 100% and peptone meal by 95%. Atropine sulfate administered in a dose of 0.288 μM/kg/hr also inhibited gastric response to all these stimulants except histamine. These results can be explained in 3 ways: 1) all secretagogues act *via* histamine, and metiamide blocks the action of this final common chemostimulator; 2) the receptors for histamine, gastrin, and acetylcholine interact on the parietal cells and the inhibition of histamine receptors by metiamide decreases the affinity of the other 2 receptors to their antagonists; or 3) metiamide is a nonselective inhibitor of parietal cell receptors.

0092 EFFECTS OF PROPRANOLOL ON GASTRIC SECRETION IN ALBINO RATS.

(E.) Debnath, P. K.; Gode, K. D.; Das, D. G.; Sanyal, A. K. (Inst. Med. Sci., Banaras Hindu Univ., Varanasi, India). *Br. J. Pharmacol.* 51(2):213-216, 1974.

The effects of graded doses of propranolol (0.5-50.00 mg/kg i.p.) on gastric secretion and pyloric-ligated ulcers were studied in inbred albino rats of both sexes. In all experiments, propranolol was administered 30 min before pyloric ligation for 4 hr. A dose of 1 mg/kg propranolol caused a significant increase and 50 mg/kg caused a significant inhibition of the volume (ml/100 g), total acid output (μM/4 hr), and total peptic activity (μM tyrosine/4 hr) of the gastric juice. Although total acid output decreased at the highest dose of propranolol, there was no significant change in peptic activity/ml gastric juice. The effect of propranolol on pyloric-ligated ulcers was also dose dependent: 1 mg/kg caused an increase while 50 mg/kg produced a significant decrease in the incidence of pyloric-ligated ulcers. This finding suggests that the ulcerogenic mechanism in pyloric-ligated rats is directly proportional to the total acid and pepsin output.

0093 PURE HUMAN MINIGASTRIN: SECRETORY POTENCY AND DISAPPEARANCE RATE.

(E.) Debas, H.; Walsh, J. H.; Grossman, M. I. (VA Wadsworth Hosp. Cent., Los Angeles, Calif.). *Gut* 15(9):686-689, 1974.

Pure human natural nonsulfated minigastrin (HG-13-I) and pure human natural nonsulfated heptadecapeptide gastrin (HG-17-I) were compared with regard to acid-stimulating potency and rate of disappearance from the blood in 3 dogs with gastric fistulas and Heidenhain pouches given continuous i.v. infusion in doses of 100, 200, 400, and 800 pM/kg/hr. Equimolar infusion rates of HG-13-I and HG-17-I caused equimolar increases over basal of serum immunoreactive gastrin, though HG-13-I was less than half as potent as HG-17-I in stimulating acid secretion (potency ratio 0.4; 95% confidence limits 0.2-0.6). Clearance rates, calculated by dividing the dose infused by the plateau blood level of gastrin, were similar for the 2 gastrins (79 ml/kg/min mean value for HG-13-I and 83 ml/kg/min for HG-17-I). The half time for disappearance of HG-13-I from the blood was 1.75 min and its volume of distribution was calculated to be 0.17 liter/kg, values similar to those found for HG-17-I in an earlier study (2.9 min and 0.24 liter/kg, resp.). It is suggested that these differences may not be significant, but the problem requires further study.

0094 EFFECT OF GANGLIONIC AND MUSCARINIC BLOCKADE ON MECHANISM OF PEPSIN-SECRETION STIMULATION.

(E.) Magee, D. F.; Dutt, B. (Creighton Univ. Sch. Med., Omaha, Nebr.). *Am. J. Physiol.* 227(5):1178-1180, 1974.

The effect of ganglionic and muscarinic blockade on the stimulation of pepsin secretion was examined in conscious Labrador dogs with gastric fistulas and Heidenhain pouches. Gastrin pentapeptide (GP) in doses up to 2 μg/min i.v. did not stimulate pepsin secretion from denervated fundic pouches (5 dogs), while atropine (1 mg i.v.) and pentolinium tartrate (1 mg/kg i.m.) reduced basal pepsin output by about 50%. GP (1 μg/min) was as effective on acid secretion after the ganglionic blocking agent (pentolinium tartrate) as without it, whereas atropine depressed GP-stimulated pouch acid from about 200-20 mEq acid. The usual GP-stimulation of fistula pepsin secretion (5 dogs) was abolished by both pentolinium and atropine, though acid secretion was unchanged by pentolinium and reduced by atropine from about 250 to 50 mEq. Atropine (0.5 mg; 5 dogs) virtually abolished pilocarpine (40 μg/min) stimulation of acid and pepsin in the denervated pouch, while pentolinium had no effect on either pepsin or acid. Atropine (0.5 mg; 5 dogs) abolished the acid and pepsin response to pilocarpine (40 μg/min) for gastric fistula, while ganglionic blockade (1 mg/kg pentolinium) greatly reduced, but did not abolish, the dose-related pilocarpine stimulation of pepsin (from 400 to 150 pepsin U/10 min collection) and acid (800 to 250 mEq). The acid data were not exact since contamination with saliva was great. Secretin (up to 2 secretin U/min) did not stimulate acid secretion from either pouch or fistula (6 dogs) but was a potent pepsin stimulant in both, raising the pepsin output by about 100 U in each case. Pentolinium (5 mg) raised secretion of pouch pepsin from 63.8 to 96.6 U, while 0.25 mg atropine i.v. reduced pepsin secretion from 76.6 to 58.3 U. Secretin stimulation (up to 2 secretin U/min; 6 dogs) of fistula as a rule resulted in regurgitation of duodenal juice into the stomach. Ganglionic blockade (1 mg/kg i.m. pentolinium) did not alter the secretin-pepsin dose-response curve for fistula, while atropine (1 mg i.v.) abolished the secretin-pepsin dose-response relationship. Both secretin and pilocarpine appear to act directly on the chief cell *via* a muscarinic mechanism, whereas GP appears to act indirectly, possibly *via* a nicotinic ganglionic mechanism that is absent in the Heidenhain pouch. In contrast, GP and pilocarpine, as determined by muscarinic blockade, appear to act similarly in both pouch and fistula; secretin does not stimulate acid in either pouch or fistula.

0095 GAS CHROMATOGRAPHIC-MASS SPECTROMETRIC DETERMINATION OF N-NITROSODIMETHYLAMINE FORMED IN SYNTHETIC AND HUMAN GASTRIC JUICE. *(E.)*

Lane, R. P.; Rice, R. H.; Bailey, M. E. (Dep. Food Sci. Nutr., Univ. Missouri, Columbia). *J. Agric. Food Chem.* 22(6):1019-1023, 1974.

An analytical procedure for the determination of N-nitrosodimethylamine in human gastric juice is described. The method involves alkalization of gastric juice with potassium hydroxide, reflux for 4 hr followed by acidification with sulfuric acid/sodium sulfate and extraction with chloroform. The chloroform extract is reextracted with sodium hydroxide and the solution is concentrated by evaporation. The extracts are eluted on an acidic Celete column with chloroform. N-nitrosodiethylamine is added as an internal standard and N-nitrosodiethylamine levels are determined by gas chromatography and confirmed by low and high-resolution mass spectroscopy. The method allows detection of nitrosamine concentrations as low as 0.1 ppb. The recovery of 2.5-10.0 μg N-nitrosodiethylamine from 10, 100 ml aqueous solution samples was 76-96% (mean 87%) and that from 3, 100 ml human gastric juice samples containing 5 μg averaged 79% (76-82%). Glycine (1.3 mM) inhibited nitrosamine formation in gastric juice by about 80% in the presence of 5 μg and by 87% in the presence of 10 μg diethylamine at pH 3.4. Optimal pH for nitrosamine formation in human gastric juice was 2.5 instead of 3.4 as predicted from nitrous anhydride reactions. An amino acid mixture inhibited nitrosamine formation at pH 2.5 and stimulated formation at pH 4.5. Aqueous meat extract inhibited nitrosamine formation by about 30% at pH 2.5 and 4.5. It should thus be possible to detect and confirm whether or not N-nitrosodimethylamine is formed *in vivo* after digestion of cured meats or other food materials.

0096 GASTRIC MUCOSAL ENERGY METABOLISM AND "STRESS ULCERATION". *(E.)*

Menguy, G.; Masters, Y. F. (Univ. Rochester Sch. Med., N.Y.). *Ann. Surg.* 180(4):538-548, 1974.

Gastric mucosal histologic and energy metabolism changes were studied in rats and rabbits in which hemorrhagic shock was induced by acute blood loss. In rats in which hemorrhagic shock was induced by removing 20 ml/kg blood from the vena cava in 2 min, focal, superficial epithelial gastric necrosis was present after 15 min, and by 60 min all animals had focal mucosal hemorrhage with superficial erosions ("stress ulcers") in the corpus and fundus but not in the antrum. Associated with these changes was a 75% decrease in gastric mucosal ATP and a 47% drop in total mucosal adenosine phosphates. Production of warm ischemia for 30-60 sec in the stomachs of rats by complete tissue severance resulted in a 50% drop in gastric mucosal adenosine phosphates within 15 sec. In addition, gastric mucosal glycogen was decreased by 60% after 60 sec of ischemia. Comparative studies of the antrum, corpus and fundus mucosas of rabbits acutely bled to 30 mm Hg blood pressure showed a more rapid breakdown of high energy phosphate as well as a more rapid glycolytic flux in the corpus and fundus than in the antrum. Dephosphorylation of adenosine phosphates in the ischemic corpus and fundus mucosa of rabbits in shock was 2-fold greater than in the ischemic antrum. Similar studies using fasted rabbits showed that a greater mucosal energy deficit was accompanied by more severe gastric mucosal injury. When the bile salt, sodium taurocholate (30 mM) was present in the stomach of shocked rabbits, gastric mucosal ulceration was more severe, the mucosal energy deficit was greater, mitochondrial oxidative phosphorylation was uncoupled and ($Na^+ + K^+$)-ATPase activity of corpus mucosal homogenates was completely inhibited. These studies are consistent with the hypothesis that an energy deficit severe enough to cause cellular necrosis is the event linking shock-induced gastric mucosal ischemia and stress ulceration.

0097 PROLIFERATION OF THE GLANDULAR EPITHELIUM IN THE RESECTED STOMACH OF RATS. *(Rus.)*

Timashkevich, T. B.; Zaporozhchenko, I. G. (Inst. Hum. Morphol., Moscow, USSR). *Biull. Eksp. Biol. Med.* 78(7):94-98, 1974.

Forty 200-300 g male rats had 45-50% of the fundal wall resected. Pulse labeling and thymidine-^{3}H injection every 5 hr within 24 hr (0.3 μCi/kg) indicated an increase in DNA synthesizing and dividing cells of all types in the chief peptic glands within the first 3 days after the resection. In 5-10 days cell proliferation was slower than in the intact animals, except DNA synthesizing parietal cells. After 3-6 months the daily number of DNA-synthesizing cells of all types reached the level of the intact animals. There was an increase in the surface and crypt epithelium cells, and mucous neck and parietal cells. Partial reduction and regression to a more primitive level of differentiation was observed in peptic cells.

0098 FUNCTIONAL AND MORPHOLOGICAL RECONSTRUCTION OF THE GASTRIC GLANDULAR APPARATUS IN DISORDERS OF THE EXOCRINE PANCREAS AND EXPERIMENTAL REFLUX PANCREATITIS. *(Rus.)*

Blagovidov, D. F.; Pomel'tsov, A. N.; Shatalov, V. N.; Gerasimova, O. B. (4th Princ. Off., Minist. Health USSR, Moscow). *Biull. Eksp. Biol. Med.* 78(7):33-36, 1974.

Studies were made of the fundal mucosa in dogs with excluded exocrine pancreas and experimental reflux pancreatitis. Findings indicate a substantial increase of the chief cells and decrease of the parietal cells in the fundal gastric glands within 6-17 months after suturing the pancreatic ducts. Elevated

RNA concentration was observed in the chief cells. The morphological changes in the peptic glands were stable throughout the 20-month experiment, and fully correlated with the previous data on the changes in the gastric function brought on by the disruption of the exocrine pancreas: higher peptic capacity of the gastric juice was obviously related to the numerical increase of the chief cells in the fundal mucosa, while the acidity drop was the result of the fewer parietal cells. The functional and morphological readjustment of the peptic glands in experimental reflux pancreatitis and occlusion of the pancreatic ducts may be a compensatory reaction to the disruption of the exocrine pancreatic function.

0099 THE CONTAMINATION OF GASTRIC JUICE BY THE MUCOUS SECRETIONS OF THE UPPER DIGESTIVE TRACT. *(E.)* Lambert, R. (INSERM, Edward Herriot Hosp., Lyon, France). *Rend. Gastroenterol.* 6(1):60-64, 1974.

0100 ACTION MECHANISMS OF SUBSTANCES INHIBITING GASTRIC ACID SECRETION. *(Fr.)* Bali, J. P.; Pham-Thanh-Chi (Fac. Pharm., Montpellier France). *Trav. Soc. Pharm. Montpellier* 34(3):197-206, 1974.

0101 EFFECT OF INCREASING DOSES OF PENTAGASTRIN ON ACID SECRETION IN PERFUSION EXPERIMENTS ON THE RAT STOMACH FOLLOWING VAGOTOMY. *(Ger.)* Struve, C. W.; Hantschmann, N. (Surg. Clin., Univ. Kiel, Germany). *Res. Exp. Med. (Berl.)* 163(4):289-298, 1974.

0102 INFLUENCE OF SPLENECTOMY ON GASTRIC JUICE SECRETION AND ULCERATION IN RATS. *(Ger.)* Koch, G.; Schumpelick, V.; von Rehren, D. (Surg. Clin., Univ. Hamburg, Germany). *Langenbecks Arch. Chir.* 336(1):15-23, 1974.

0103 SERUM GASTRIN IN UREMIC PATIENTS DURING HEMODIALYSIS. *(Ger.)* Pointner, H.; Flegel, U.; Schmidt, P.; Zazgornik, J.; Kopsa, H.; Waldhausl, W. (1st Med. Clin., Univ. Vienna, Austria). *Wien. Klin. Wochenschr.* 86(22):696-699, 1974.

0104 SERUM GASTRIN AFTER A TEST MEAL IN PATIENTS UNDERGOING RENAL DIALYSIS. *(Ger.)* Pointner, H.; Flegel, U.; Schmidt, P.; Zazgornik, J.; Kopsa, H.; Waldhausl, W. (1st Med. Clin., Univ. Vienna, Austria). *Wien. Klin. Wochenschr.* 86(22): 699-702, 1974.

See also, 0018, 0448, 0730.

SECRETION AND METABOLISM

Pancreas

0105 INDUCTION OF CHYMOTRYPSINOGEN BY HYDROCORTISONE IN EMBRYONIC CHICK PANCREAS IN VITRO. *(E.)* Cohen, A.; Kulka, R. G. (Dep. Biol. Chem., Heb. Univ. Jerusalem, Israel). *J. Biol. Chem.* 249(14):4522-4527, 1974.

Stimulation of chymotrypsinogen accumulation by hydrocortisone was studied *in vitro* in pancreas explants from 9-day-old chick embryos. After incubation with hydrocortisone (10^{-6} M for 22 hr), 75% of the chymotrypsinogen was released into the medium. After 45 hr of incubation, 73% of the enzyme was released. A lag of 10-15 hr in response of pancreas explants to hydrocortisone was noted. The dose-response curve for chymotrypsinogen showed that the latter increased with hydrocortisone concentration and reached a maximum when the hormone concentration was about 8 x 10^{-7} M. The threshold of hormone concentration was 2-4 x 10^{-8} M. Radioimmunoprecipitation studies showed that the hormone selectively stimulated *de novo* synthesis of chymotrypsinogen. The rate of synthesis increased with the time of incubation. The net chymotrypsinogen cpm/total cpm x 100 was 0.92 after 15 hr, 2.33 after 24 hr, and 3.19 after 48 hr. Exposure of pancreas explants to hydrocortisone for 3 hr followed by washing out of the hormone and incubation for 48 hr gave the same degree of incubation of the enzyme (23.6 U/pancreas x 10^3) as continuous exposure to the hormone for 48 hr (27.9 U/pancreas x 10^3). Actinomycin D (50 μg/ml) was added at zero time and hydrocortisone (10^{-6} M) was added 1/2 hr later. Actinomycin D inhibited the induction of enzyme by 90-100% in the 9-day-old pancreas (18 hr incubation). The 12-day-old pancreas (20 hr incubation) showed an inhibition from 50-80%. A marked inhibition of enzyme synthesis was observed when actinomycin D was added at zero time or up to 5 hr after the addition of hydrocortisone. There was almost no effect on chymotrypsinogen accumulation when actinomycin D was added 10 hr after hydrocortisone.

0106 STUDY BY AUTORADIOGRAPHY OF THE TRANSPORT AND EXCRETION OF PANCREATIC ENZYMES IN THE ACINAR CELL OF ALCOHOLIC RATS. *(Fr.)* Lechene, P.; Sarles, H. (Res. Unit Dig. Pathol., INSERM, Marseille, France). *Biol. Gastroenterol. (Paris)* 7(1): 61-64, 1974.

The effect of alcohol on intracellular transport and excretion of enzymes in rat pancreatic acinar cells was studied by measuring the organelle content of labeled pancreatic proteins through electron microscopic autoradiography. For 4 months, Wistar rats were given 20% alcohol (4 animals) or water (4 animals) in association with a balanced diet. The rats were sacrificed after a 24 hr fast, and pancreatic slices were labeled by 3-min incubation with ^{3}H-L-leucine 4,5, followed by incubation in a chased medium for 7, 17, 37, and 57 min. The graphs of autoradiographically measured enzymes *versus* time demonstrated no significant difference between alcoholic and control rats in the endoplasmic reticulum, Golgi bodies, and condensation vacuoles. For zymogen granules, the curves were essentially the same until 40 min when enzymes continued to increase in controls but decreased steadily in alcoholic rats (corresponding to measured increase in enzyme excreted). Thus in alcoholic rats there was increased enzyme excretion without any effect on intracellular transport.

0107 IN VIVO EFFECTS OF PANCREOZYMIN, SECRETIN, VASOACTIVE INTESTINAL POLYPEPTIDE, AND PILOCARPINE ON THE LEVELS OF CYCLIC AMP AND CYCLIC GMP IN THE RAT PANCREAS. *(E.)* Robberecht, P.; Deschodt-Lanchman, M.; De Neef, P.; Borgeat, P.; Christophe, J. (Brussels Univ. Sch. Med., Belgium). *FEBS Lett.* 43(2):139-143, 1974.

Pancreatic secretion of amylase in response to pancreozymin and pilocarpine and the time course of cyclic nucleotide levels was investigated *in vivo* in male Wistar rats. Cyclic AMP was estimated by protein binding assay and cyclic GMP was determined by radioimmunoassay. Pancreozymin (0.33 μg in 0.2 ml 0.9% NaCl, i.v.) caused a rapid increase in amylase secretion which remained high at 30 min following injection and declined to control values after 60 min. The same amount of pancreozymin caused no change in the levels of cyclic AMP (cAMP) during the 15 min following injection. Pilocarpine (30 mg/kg, s.c.) caused no apparent change in levels of cAMP. However, animals injected i.v. with secretin (2.75 μg/kg) or vasoactive intestinal polypeptide (VIP) (2.75 μg/kg in 0.2 ml 0.9% NaCl), caused the cAMP level to double. Cyclic AMP increased in 30 to 60 sec and declined to control value in 10-15 min. Pilocarpine (30 mg/kg, s.c.) and pancreozymin (0.33 μg in 0.2 ml 0.9% NaCl, i.v.) caused a 2-fold increase in cyclic GMP levels at 5-6 min after injection, and decreased sharply thereafter, declining to control levels after about 10-15 min. These results support the role of cAMP as second messenger of secretin, and they suggest also that the hormonal receptor sites of secretin and VIP are connected to the same adenylate cyclase. The rise of cyclic GMP may be due to an increase in protein phosphorylation which is associated with the stimulation of amylase.

0108 INHIBITION OF PANCREATIC EXOCRINE SECRETION BY INTRA-COLONIC OLEIC ACID INFUSION IN THE DOG. *(E.)* Hage, G.; Tiscornia, O.; Palasciano, G.; Sarles, H. (Dig. Pathol. Unit, INSERM, Marseille, France). *Biomedecine* 21(6):263-267, 1974.

The effects of an oleic acid perfusion in the proximal colon on exocrine pancreatic secretion was studied in 3 dogs, surgically prepared with gastric, duodenal, ileal, and colonic fistulas. Secretin (1.0 U/kg/hr, i.v.) was infused by catheter, and maintained at a constant rate of 100 ml/hr. When the flow rate of pancreatic secretion became constant, oleic acid (20 ml) was perfused for 10 min into the proximal colon and changes in pancreatic secretion were evaluated for 80 to 100 min. In a control series, oleic acid (20 ml) was injected into the distal ileum. Volume, bicarbonate concentration, bicarbonate output, protein concentration and protein output were measured every 20 min. Gastric levels were determined before and in every 20 min sample following the ileal or colonic oleic acid perfusion. There was a marked and prompt decrease of pancreatic secretion after oleic acid infusion into the colon. Volume decreased 40%; bicarbonate output, 47%; and protein output, 56%. Protein concentration did not decrease significantly. Gastrin and fatty acid blood levels did not change, and saline did not affect the pancreatic secretion or gastrin level. There was an increase in pancreatic secretion for the first 60 min following infusion of oleic acid into the ileum. Protein output increased 80% and remained significant for 40 min. Volume increased 30%, but bicarbonate output only increased 28%. Gastrin levels did not increase after infusion and instilled saline did not affect any of the parameters studied. These results demonstrate that oleic acid infusion into the colon has an inhibitory effect on exocrine pancreas secretion. It is suggested that pancreatic secretion decreases during digestion, due to the arrival of digestion products into the colon.

0109 FUNCTION OF THE EXOCRINE PANCREAS IN THE RAT: INHIBITION BY LARGE DOSES OF CHOLECYSTOKININ-PANCREOZYMIN AND ANESTHESIA. *(Ger.)* Hotz, J.; Neumann, K.; Zoller, A.; Ziegler, R.; Goebell, H. (Dep. Intern. Med., Univ. Ulm, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:862-865, 1973.

The effect of large doses of cholecystokinin-pancreozymin on the trypsin secretion by the pancreas was studied in conscious and anesthetized male Wistar rats. Increasing doses of cholecystokinin-pancreozymin (1, 2, 4 and 8 U/100 g/10 min in i.v. infusion) caused progressive reduction of the trypsin secretion maxima and shortened duration of these maxima from 50 to 30 min during stimulation for 3 hr in rats anesthetized by i.m. administration of 300 mg urethane per 100 g. The absence of secreted granules in the acinus cell at the end of the stimulation is indicative of the progressive inhibition not only of the secretion but also of the production of trypsin. This paradoxical inhibition of the enzyme secretion by the same doses of cholecystokinin-pancreozymin was absent in conscious animals. Both urethane and pentobarbital inhibited the basal and stimulated pancreas secretion.

0110 CELLULAR CHANGES IN THE EXOCRINE PANCREAS OF RATS FED TWO LEVELS OF MAGNESIUM AND PROTEIN. *(E.)* Greger, J. L.; Schwartz, R. (Coll. Human Ecol., Cornell Univ., Ithaca, N.Y.). *J. Nutr.* 104(12):1610-1617, 1974.

The acute and chronic effects of magnesium deficiency on the pancreas were studied in male Sprague-Dawley rats fed a diet containing either 15 or 30% casein and 50 ppm Mg^{++} for 60 days. Controls received a 15 or 30% casein diet containing 100 ppm Mg^{++}. Mg^{++} deficiency as determined by atomic absorption spectrophotometry occurred earlier in rats fed the 30% casein diet (day 15) than in those fed the 15% diet (day 35). Plasma Mg^{++} levels were significantly reduced by day 5 regardless of protein content of the diet. Plasma Ca^{++} showed no change. Blood histamine levels increased earlier and reached higher peak levels in Mg^{++} depleted rats fed the 30% casein diet. Pancreatic weights increased with time but showed no relation to the type of diet. Pancreatic Mg^{++} concentrations were also unaffected by diet. Pancreatic weight, RNA, protein and chymotrypsin levels were studied in 24-hr fasted and refed rats after 10 days of dieting. Pancreatic weights were highest in rats fed the 30% casein 100 ppm Mg^{++} diet. No differences occurred in fasted rats. No changes in RNA content were seen in any group. Protein content was greater in refed than fasted rats fed the 50 ppm Mg^{++} diet. Chymotrypsin levels were unaffected by dietary Mg^{++}. Incorporation of i.v. injected ^{14}C-valine into pancreatic protein was significantly greater after 2 hr in fasted rats fed the 100 ppm Mg^{++} than in those fed the 50 ppm Mg^{++} diet regardless of casein content. No such differences were observed in refed rats, and the differences in the fasted animals were at least in part due to differences in the rate of ^{14}C-valine transport into the pancreatic cells. The results of these studies confirm previous studies which also showed no change in pancreatic Mg^{++} content and function in Mg^{++} deficient animals.

0111 COMPARISON OF THE ACTIONS OF PORCINE SECRETION AND EXTRACTS OF CHICKEN DUODENUM ON PANCREATIC EXOCRINE SECRETION IN THE CAT AND TURKEY. *(E.)* Dockray, G. J. (Dep. Physiol., Univ. Liverpool, England). *J. Physiol. (Lond.)* 244(3):625-637, 1975.

0112 STIMULATION OF PANCREATIC ELECTROLYTE SECRETION BY CHOLERA TOXIN. *(E.)* Case, R. M.; Smith, P. A. (Univ. Med. Sch., Newcastle upon Tyne, England). *J. Physiol. (Lond.)* 244(1);28P-29P, 1975.

0113 THE ACTIVE SITE OF PANCREATIC PORCINE ELASTASE: SPECIFICITY, SIZE AND STEREOSPECIFICITY. *(E.)* Atlas, D. (Weizmann Inst. Sci., Rehovot, Israel). *Isr. J. Chem.* 12(1/2):455-469, 1974.

0114 EFFECT OF SYNTHETIC PROTEASE INHIBITORS ON THE ACTION AND ACTIVATION OF PROTEOLYTIC PANCREATIC ENZYMES. *(Ger.)* Markwardt, F.; Walsmann, P.; Hoffmann, J. (Med. Acad., Erfurt, Germany). *Acta Biol. Med. Ger.* 32(5):433-439, 1974.

0115 PARTIAL PURIFICATION AND STUDY OF THREE PROTEIN KINASES FROM RAT PANCREAS. *(Fr.)* Cenatiempo, Y.; Marchis-Mouren, G. (Inst. Biol. Chem., Univ. Aix-Marseille, France). *C. R. Acad. Sci.* [*D*] *(Paris)* 279(20):1633-1636, 1974.

0116 LONG-TERM EXOCRINE FUNCTION OF THE PANCREAS TRANSPLANT. *(E.)* Charters, III, A. C.; Lee, S.; Storck, G.; Chandler, J. G.; Orloff, M. J. (Univ. California Sch. Med., San Diego). *Am. J. Surg.* 129(1):16-22, 1975.

0117 ENZYMATIC EFFECTIVENESS OF PANCREATIC SUBSTITUTION THERAPY BY DRUGS AND SUGAR-COATED PILLS. *(Ger.)* Malis, F.; Premysl, F. (2nd Gastroenterol. Res. Dep., Charles Univ., Prague, Czechoslovakia). *Z. Gesamte Inn. Med.* 29(14):569-576, 1974.

See also, 0098.

SECRETION AND METABOLISM

Hepatobiliary Tract

0118 EFFECT OF DIETARY CHENODEOXYCHOLIC ACID AND LITHOCHOLIC ACID IN THE RABBIT. *(E.)* Fischer, C. D.; Cooper, N. S.; Rothschild, M. A.; Mosbach, E. H. (Public Health Res. Inst., New York, N.Y.). *Am. J. Dig. Dis.* 19(10):877-886, 1974.

The feeding of chenodeoxycholic acid or lithocholic acid (0.05 or 0.5% of the diet) to rabbits produced cirrhotic and necrotic changes in the liver, accompanied by an increase of secondary bile acids in bile. Animals fed 0.05% lithocholic acid, 0.05% or 0.5% chenodeoxycholic acid, but not those receiving 0.5% lithocholic acid were able to survive for a period of 21 days. The most severe cirrhotic and necrotic changes were observed in the rabbits fed either 0.5% lithocholic acid or 0.5% chenodeoxycholic acid for 6 days or longer. These changes included focal hepatocyte necrosis, bile duct proliferation, lymphocytic, histiocytic and occasionally neutrophilic portal infiltrations and portal fibrosis. Liver damage appeared to correlate with bile composition but not with hepatic cholesterol content. The pathologic involvement was greatest whenever the percentage of lithocholic acid in the bile exceeded 15%. It is concluded that chenodeoxycholic acid (which is not a major constituent of rabbit bile) exerts its hepatotoxic effects largely because it is converted to lithocholic acid by the intestinal bacterial flora.

0119 ACTIVITIES OF PROLYL HYDROXYLASE, LYSYL HYDROXYLASE, COLLAGEN GALACTOSYLTRANSFERASE AND COLLAGEN GLUCOSYLTRANSFERASE IN THE LIVER OF RATS WITH HEPATIC INJURY. *(E.)* Risteli, J.; Kivirikko, K. I. (Dept. Med. Biochem., Univ. Oulu, Finland). *Biochem. J.* 144(1):115-122, 1974.

The activities of prolyl hydroxylase, lysyl hydroxylase, collagen galactosyltransferase and collagen glucosyltransferase, four enzymes catalyzing posttranslational modifications of the collagen polypeptide chains, were assayed in the livers of rats with experimental hepatic injury. The liver injury was induced by injecting CCl_4 (0.05 ml/100 g) twice weekly, and assays of the enzymic activities were carried out in liver homogenates preincubated in Triton X-100 2 and 4 weeks after commencement of administration of CCl_4. The activities of all four enzymes had increased by 2 weeks after commencement of CCl_4 administration. This increase preceded an increase in the collagen content of the liver. A further slight increase was found in three of the enzyme activities during the subsequent 2 weeks of the experiment, whereas no further increase was found in the collagen galactosyltransferase activity. A statistically significant correlation was found between all four enzyme activities, but the magnitude of the increases varied considerably. The largest increase was found in lysyl hydroxylase activity, and at 4 weeks the magnitude of this was about 3 times that of the collagen galactosyltransferase activity. The results thus indicate that the increased enzyme activities cannot be explained simply by an increase in the number of collagen-producing cells having similar enzyme activity patterns to those of the cells initially present in the liver.

0120 RESTORATION OF HEPATIC MITOCHONDRIA DURING RECOVERY FROM CARBON TETRACHLORIDE INTOXICATION. *(E.)* Brabec, M. J.; Gray, R. H.; Bernstein, I. A. (Univ. Michigan, Ann Arbor). *Biochem. Pharmacol.* 23(23):3227-3238, 1974.

The functional and morphological recovery of rat hepatocyte mitochondria was studied following liver injury induced by a single i.p. injection of CCl_4 (1.4 ml/kg). Hepatocyte mitochondrial damage, which occurred beginning about 35 hr after CCl_4 injection, was characterized by a loss of respiratory activity, loss of phosphorylation coupled to respiration, and mitochondrial swelling attended by loss of cristae structure. Within 15-25 hr after full development of the mitochondrial lesion, the function and structure of the mitochondria were largely restored. Studies of the turnover of mitochondrial DNA and the rates of synthesis of mitochondrial DNA and protein indicated that the CCl_4-insulted hepatocyte is repairing the mitochondrial damage by the insertion of specific elements into the damaged organelle, rather than by proliferation of undamaged mitochondria for replacement. The failure of ethidium bromide, oxytetracycline and chloramphenicol, specific inhibitors of mitochondrial protein, and/or nucleic acid synthesis, to block this restoration substantiates the postulated repair process, and also indicates the noncritical nature of the respective mitochondrial functions during the repair process. Cytochrome measurements made during the period of acute damage revealed normal levels of cytochrome c, c_1 and aa_3. The observed elevation of cytochrome b is attributed to contamination of the preparation by hemoglobin.

0121 NATURE OF THE PROTECTION AGAINST CARBON TETRACHLORIDE-INDUCED HEPATOTOXICITY PRODUCED BY PRETREATMENT WITH DIBENAMINE [N-(2-CHLOROETHYL) DIBENZYLAMINE]. *(E.)* Maling, H. M.; Eichelbaum, F. M.; Saul, W.; Sipes, I. G.; Brown, E. A. B.; Gilette, J. R. (Natl. Heart Lung Inst., Bethesda, Md.). *Biochem. Pharmacol.* 23(10):1479-1491, 1974.

The plausible mechanisms by which Dibenamine [N-(2-chloroethyl) dibenzylamine] hydrochloride pretreatment (25 mg/kg s.c., 48 and 24 hr prior to administration of 1.0 mg/kg i.p. of CCl_4) protects rats against the hepatotoxic effects of CCl_4 have been elevated. Also, the distribution of ^{14}C-Dibenamine derivatives and their covalent binding to liver lipids and proteins (total and microsomal) has been studied at times of maximal protection against CCl_4-induced hepatotoxicity. Dibenamine pretreatment did not affect significantly the absorption of CCl_4 after i.p. administration or the elimination of CCl_4 from various tissues, as evident from unchanged tissue levels. Dibenamine pretreatment decreased the accumulation of the metabolite $CHCl_3$ in liver, the isopropanol-potentiated covalent binding of a small dose of $^{14}CCl_4$ (0.1 ml/kg) and the covalent binding of a necrosis-producing dose of $^{14}CCl_4$ (0.1 ml/kg) to proteins and lipids in liver, and the diene conjugation of liver microsomal lipids induced by CCl_4. These findings suggest that Dibenamine pretreatment impairs the microsomal enzymes which catalyze the formation of free radical derivatives of CCl_4. Dibenamine protection is not correlated with its concentration in liver or with the covalent binding of Dibenamine derivatives to liver microsomal protein.

0122 COLLAGENASE ACTIVITY IN EXPERIMENTAL HEPATIC FIBROSIS. *(E.)* Okazaki, I.; Maruyama, K. (Sch. Med., Keio Univ., Tokyo, Japan). *Nature* 252(5478):49:50, 1974.

The presence of collagenase in rat liver was demonstrated along with increased collagenase activity in experimental hepatic fibrosis induced by carbon tetrachloride. Fifty female Wistar rats received s.c. injections of 0.3 ml 50% CCl_4 in olive oil per 100 g body weight twice a week. Diced specimens of rat liver were incubated with collagen gels reconstituted from collagen that was salt extracted from the skin of young, growing Wistar rats. In 10 non-treated rats, 2 livers demonstrated weak collagenase activity, 5 livers minimal activity, and another 3 no appreciable lysis. In the CCl_4-treated rats, collagenolytic activity increased slightly in the initial stage of hepatic fibrosis (3 weeks after treatment) and markedly during extensive fibrosis (6 weeks). Collagenolytic activity in the irreversible cirrhotic stage (20 weeks) was poor compared with activity observed after 6 weeks. Under microscopic examina-

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tion, livers from treated rats showed slight to moderate periportal fibrosis after 3 weeks, the formation of fibrous septa connecting portal tracts with the central canal after 6 weeks, and typical features of cirrhosis after 20 weeks. Collagenolytic activity was inhibited by the addition of sodium diaminetetraacetate (1×10^{-2} M final concentration). Neither aerobic nor anaerobic bacterial contamination was detected in gels where lysis was observed. Acrylamide gel electrophoresis of collagen incubated with pre-cirrhotic rat liver showed patterns similar to those seen with other animal collagenases. The increased collagenolytic activity was thus concluded to be due to collagenase. The proliferation of collagen fibers appeared to result from a more rapid synthesis of collagen in comparison to its resorption. Discontinuation of toxic stimuli presumably results in increased collagenolytic activity to resorb the excessive collagen fibers.

0123 HEMODYNAMIC EFFECTS OF CCl_4 IN THE INTACT LIVER OF THE CAT. *(E.)* Lautt, W. W.; Plaa, G. L. (Dep. Pharmacol., Univ. Montreal, Canada). *Can. J. Physiol. Pharmacol.* 52(3):727-735, 1974.

The hemodynamic changes in the liver of anesthetized cats was studied following CCl_4 administration. Blood flow in the intact liver did not change significantly over a period of 4 hr following intraduodenal injection of CCl_4 (1 ml/kg). Hepatocellular disruption, as determined by changes seen by the electron microscope, was well underway 2 hr after the injection. Twenty-four hours following an oral dose of CCl_4, the hepatic arterial resistance to blood flow was reduced and total blood flow to the liver was at least as high as in control animals. At this time, the hepatic artery appeared fully dilated and was less responsive to humoral (intra-arterial infusion of noradrenaline) and neural (reflex activation of the sympathetic nerves) constrictor influences. Thus, alterations in hepatic blood flow do not occur during the early phases of CCl_4-induced hepatic injury. These data indicate that diminished blood flow is not a causative factor in the initial phases of CCl_4-induced liver injury. By 24 hr, hepatic blood flow is altered in such a manner that the damaged liver receives a higher proportion of arterial blood and a total blood flow that is not reduced in spite of a generally depressed cardiovascular system.

0124 FAILURE OF PHENOBARBITAL TO INCREASE BILIRUBIN PRODUCTION IN THE RAT. *(E.)* Gisselbrecht, C.; Berk, P. D. (Natl. Inst. Arthritis Metab. Dig. Dis., Bethesda, Md.). *Biochem. Pharmacol.* 23 (20):2895-2905, 1974.

Bilrubin production, as measured by bile bilirubin excretion, in Sprague-Dawley rats after surgical creation of an external biliary fistula was assessed for groups of animals pretreated with phenobarbital (70 mg/kg i.p.) for 5 days prior to surgery, untreated rats, and rats receiving 4 days of phenobarbital treatment (70 mg/kg i.p.) 24 hr after surgery. Bile bilirubin excretion in 16 untreated animals averaged 0.71 mg/100 g/day during the 24-hr period following surgery. Despite the wide range (0.48-1.10 mg/100 g/day) in the group, values for each individual animal were highly consistent, averaging 101, 103, 93, and 92% of the initial 24-hr period baseline value during the 4 subsequent 24-hr collection periods. Bile bilrubin excretion in 15 rats pretreated with the drug for 5 days prior to surgery averaged 0.86 mg/100 g/day in the initial collection period. This did not represent a significant increase when compared to untreated controls. Values of bile bilirubin excretion likewise remained constant during subsequent collection periods during phenobarbital treatment. Although the initiation of phenobarbital therapy 24 hr after biliary surgery was associated with high mortality, adequate data were obtained for a group of 6 animals receiving 4 days of phenobarbital treatment (70 mg/kg i.p.). During the postoperative treatment period which was sufficient to produce a 2- to 3-fold increase in early labeling of bile bilrubin and a 3- to 4-fold increase in hepatic cytochrome P-450, bile bilirubin excretion averaged 105, 92, 80, and 100% of the baseline pretreatment value during 24-hr collection periods. Hence, phenobarbital-associated increases in early labeling of bile pigment and hepatic cytochrome P-450 content are not accompanied by an increase in total bilirubin excretion.

0125 INDUCTION BY PHENOBARBITAL OF HEPATIC MICROSOMAL DRUG-METABOLIZING ENZYME SYSTEM IN PARTIALLY HEPATECTOMIZED RATS. *(E.)* Hino, Y.; Imai, Y.; Sato, R. (Inst. Protein Res., Osaka Univ., Japan). *J. Biochem.* 76(4):735-744, 1974.

Phenobarbital induction (100 mg/kg, i.v.) of microsomal drug-metabolizing enzymes was studied in the residual portion of livers from partially hepatectomized male Sprague-Dawley rats. Phenobarbital injection 1 hr postoperatively resulted in a 150% rise in cytochrome P-450 over controls during the subsequent 48 hr. Sham-operated rats showed a 2-fold increase, comparable to phenobarbital-treated rats without partial hepatectomy. Preoperative capacity for phenobarbital-induced cytochrome P-450 increase was regained 4 days after partial hepatectomy, paralleling liver regeneration. Measurements of cytochrome P-450, NADPH-cytochrome c reductase, and cytochrome b_5, 48 hr after inducer injections given at various times postoperatively, showed decreases of 20-40% in the basal levels of the 3 enzymes within 5-7 days, though levels normalized to preoperative values within 2 weeks. Microsomal NADPH-cytochrome c reductase was not inducible by phenobarbital in either sham or partially hepatectomized rats immediately after surgery, though it gradually became inducible to a slight extent. Cytochrome b_5 remained essentially unaffected by phenobarbital administration at all liver regeneration stages and after sham operation in agreement with results obtained from controls. Changes in the ethyl isocyanide difference spectrum of reduced cytochrome P-450 following phenobarbital injection 4 days after partial hepatectomy were similar to those in inducer-treated sham-operated rats, although immediately after hepatectomy no changes were observed. The specific activity of aminopyrine N-demethylase of all microsomal preparations examined was linearly proportional to the specific content of cytochrome P-450.

0126 CHANGES IN IN VIVO METABOLISM OF BILE ACIDS IN RAT AFTER TREATMENT WITH PHENOBARBITAL.

(E.) Cronholm, T.; Einarsson, K.; Gustafsson, J. A. (Dep. Chem., Karolinska Inst., Stockholm, Sweden). *Lipids* 9(11):844-849, 1974.

The influence of phenobarbital on pool size and turnover of bile acids was investigated in male Sprague-Dawley rats. Three rats were injected with phenobarbital (100 mg/kg body weight in 1 ml saline solution/day, i.p.); another group of 3 rats served as controls. After 10 days, all rats received i.p. injections of 0.1 mg [24-^{14}C]cholic acid and 0.5 mg tritium-labeled chenodeoxycholic acid. Phenobarbital-treated rats had a smaller cholic acid pool compared to control rats (6.08 mg and 23.60 mg, resp.). The pool size of chenodeoxycholic acid, plus its metabolites (α- and β-muricholic acids), was of the same magnitude in the two groups of animals. The daily production of cholic acid was decreased in phenobarbital-treated rats compared to control rats (2.12 mg and 7.24 mg, resp.). No significant difference was observed between the synthesis of chenodeoxycholic acid in the 2 groups of animals. The decreased production of cholic acid in phenobarbital-treated rats is in contrast to man where it is stimulated under these conditions. The results provide support for the view that various species and mammalian strains have differences in their ability to induce liver enzymes during drug treatment.

0127 ONTOGENESIS OF CYTOPLASMIC ORGANELLES IN RAT HEPATOCYTES AND THE EFFECTS OF PRENATAL PHENOBARBITAL ON ENDOPLASMIC RETICULUM DEVELOPMENT.

(E.) Chedid, A.; Nair, V. (Michael Reese Hosp., Chicago, Ill.). *Dev. Biol.* 39(1):49-62, 1974.

The ontogenesis of liver cytoplasmic organelles was studied by electron microscopy in the rat from the first day of appearance of liver primordium to postnatal day 5. On gestation day 11, numerous ribosomes, a large Golgi complex, prominent centrioles, and a few mitochondria and microbodies were present. The free ribosomes decreased progressively to reach the adult appearance by day of birth. The centrioles, present in almost all cells on day 11 and 13 decreased progressively and were only occasionally seen by day 17 and thereafter. The mitochondria increased progressively in number and complexity. The Golgi complex, large and multiple during fetal life, became single, small, and inconspicuous after birth. The microbodies remained without significant changes throughout development, increased sharply at birth, and remained as such postnatally. Lysosomes, absent throughout prenatal life, appeared in large numbers at birth and acquired the adult pattern at that time. Rough endoplasmic reticulum became most prominent on gestation day 13. Electron dense material, seen for the first time within the rough endoplasmic reticulum cisternae on day 15, increased further until day 20 and disappeared at birth. Smooth endoplasmic reticulum, absent during the early fetal period, appeared for the first time gestation day 20. The number of cells containing smooth endoplasmic reticulum, as well as the amount of smooth endoplasmic reticulum, progressively increased. However, smooth endoplasmic reticulum distribution was still not comparable to that in the adult hepatocyte on postnatal day 5. Attempts to induce smooth endoplasmic reticulum formation prior to gestation day 20, its normal time of appearance, using phenobarbital as inducer, were unsuccessful.

0128 EFFECTS OF PHENOBARBITAL AND ETHANOL ON RAT LIVER ALDEHYDE DEHYDROGENASES. *(E.)*

Tottmar, S. O. C.; Kiessling, K. H.; Forsling, M. (Inst. Zoophysiol., Univ. Uppsala, Sweden). *Acta Pharmacol. Toxicol. (Kbh.)* 35(4):270-276, 1974.

Liver microsomal aldehyde dehydrogenases and the drug-metabolizing system (the mixed function oxidase) were studied in Wistar rats treated with ethanol and phenobarbital. Phenobarbital treatment (100 mg/kg i.v. daily for 3 weeks) had no effect on the microsomal aldehyde dehydrogenase activity, whereas the mitochondrial aldehyde dehydrogenase activity was slightly decreased and the activities of ethylmorphine demethylase, NADPH-cytochrome *c* reductase and the concentration of cytochrome P-450 were increased 2 to 3-fold. Ethanol treatment (3 g/kg by gastric intubation for 3 weeks) caused no changes in the activities of the aldehyde dehydrogenases, and the drug metabolizing system was only slightly affected. Very little aldehyde dehydrogenase activity was found in the cytosol from livers of either control, ethanol-treated or phenobarbital-treated rats. Although the functional roles of the aldehyde dehydrogenases in the liver are largely unknown, it is conceivable that acetaldehyde formed from ethanol may exert harmful effects on different metabolic processes by acting as a competetive inhibitor of endogenous or dietary aldehydes.

0129 THE EFFECT OF ACUTE ETHANOL INGESTION ON IN VITRO METABOLISM OF CHOLINE AND ETHANOLAMINE DERIVATIVES IN RAT LIVER. *(E.)*

Roberti, R.; Binaglia, L.; Michal, G.; Brunetti, M.; Porcellati, G. (Med. Sch., Univ. Perugia, Italy). *Biochem. Pharmacol.* 23(23):3289-3298, 1974.

The effect of acute ethanol ingestion (6 g/kg *via* gastric tube) on hepatic phospholipid metabolism was studied in fasting female Wistar rats. Neither lecithin nor phosphatidylethanolamine content changed significantly in liver during the 12-hr period following ethanol ingestion. The triglyceride content of the liver increased 3-fold. An increase of lecithin and phosphatidylethanolamine synthesis by the Kennedy pathway was found *in vitro* in the homogenates and microsomal fractions prepared from the ethanol-treated rats. A higher rate of conversion of phosphorylcholine and phosphorylethanolamine to cytidine 5'-diphosphate-choline and cytidine 5'-diphosphate-ethanolamine was also found in the experimental animals. The breakdown of cytidine 5'-diphosphate choline to phosphorylcholine was noticeably decreased in the liver fractions of the ethanol-treated rats. No changes in the sequential methylation pathway for lecithin synthesis in the liver were observed after acute ethanol ingestion. The differing responses of the 2 pathways (Kennedy and stepwise methylation) to ethanol treatment could constitute an efficient means of controlling the availability of specific molecular species of lecithins for the lipoproteins to transport triglycerides to the plasma.

0130 AN EXPERIMENTAL MODEL OF ALCOHOL FEEDING AND LIVER INJURY IN THE BABOON. *(E.)*

Lieber, C. S.; De Carli, L. M. (VA Hosp., Bronx, N.Y.). *J. Med. Primatol.* 3(3):153-163, 1974.

A model has been developed for the administration to the baboon of ethanol as part of a nutritionally adequate liquid diet. With this regimen, all animals maintained their weight. Liver morphology remained normal in the controls, which were fed a 60% carbohydrate diet. Isocaloric substitution of carbohydrate (50% of total calories) by ethanol resulted in the production of fatty liver in all 9 animals, while 4 also developed alcoholic hepatitis and 1 progressed to cirrhosis. Significantly increased activities of serum glutamic oxaloacetic transaminase were observed in all hepatitic animals. Inebriation and manifestation of dependence upon withdrawal of the diet were observed. Chemical alterations produced by ethanol at the fatty liver stage were characterized by striking triglyceride accumulation and enhanced activities of microsomal enzymes, including the microsomal ethanol oxidizing system. The ability to induce hepatitis and cirrhosis by prolonged ethanol ingestion in the absence of a deficient diet disproves the popular belief that an adequate diet can prevent cirrhosis in alcoholics. These studies also support the hypothesis that hepatitis and cirrhosis are preceeded by fatty liver.

0131 ETHANOL-INDUCED CHANGES IN METHIONINE METABOLISM IN RAT LIVER. *(E.)*

Finkelstein, J. D.; Cello, J. P.; Kyle, W. E. (VA Hosp., Washington, D.C.). *Biochem. Biophys. Res. Commun.* 61(2): 475-481, 1974.

Male Sprague-Dawley rats (5/group) maintained on 3-10 day diets of 3.5, 26, or 55% casein were given daily isocaloric feeding (gastric intubation) of either ethanol (4.4 g/kg, 50% solution) or glucose (50% solution) to study ethanol-induced methionine metabolism changes in the liver. Ethanol administration had minimal effect on liver enzyme activities of rats fed 26 or 55% casein diets, with the only significant alteration being a 44-68% increase in s-adenosylmethionine synthetase specific activity for animals fed 26% casein as compared to glucose-fed rats on a 3.5% casein diet. Ethanol-treated rats on the 3.5% casein diet showed increases in s-adenosylmethionine synthetase, cystathionine synthase, and betaine-homocysteine methyltransferase activities of 56, 138, and 201%, resp., compared to controls. A 28% decrease in 5-methyltetrahydrofolate-homocysteine methyltransferase activity was also observed. Variation of alcohol administration from 24 hr to 10 days in 9 rats on 3.5% casein showed similar enzymatic activity patterns, with the 10-day patterns similar to the 3-day. The alcohol-treated rats gained weight at the same rate as controls on 3.5% casein. The results suggest a mechanism for increased dietary methionine (and choline) requirement in rats fed alcohol in combination with a protein-restricted diet. The observed enzyme changes represented a reversal of the normal adaptive response of the liver to protein-restriction, and the resultant impairment in methionine conservation could explain alcohol-induced increases in dietary lipotrope requirement.

0132 LIPID PEROXIDATION IN CHRONIC ETHANOL TREATED RATS: IN VITRO UNCOUPLING OF PEROXIDATION FROM REDUCED NICOTINE ADENOSINE DINUCLEOTIDE PHOSPHATE OXIDATION. *(E.)*

Koes, M.; Ward, T.; Pennington, S. (Cancer Res. Cent., Columbia, Mo.). *Lipids* 9(11):899-904, 1974.

In vivo and *in vitro* experiments with male and female Holtzman rats verified that chronic ethanol exposure (3 g/100 g/day) for 3 weeks (stomach tube) induces microsomal ethanol oxidizing system (MEOS) components and that lipid peroxidation is enhanced in ethanol-treated animals. Clearance data (blood ethanol level relative to an 8-hr sample) for 5 controls and 5 chronic ethanol-treated rats intoxicated with 6 g/kg ethanol showed that the latter cleared about 90% of the 8-hr ethanol value after 16 hr compared to a 60% 16-hr clearance for controls. Rats pretreated with pyrazole had a 16-hr blood ethanol level greater than the 8-hr level when given the same intoxicating dose in comparison to rats pretreated with ethanol and pyrazole which cleared 20% of the 8-hr ethanol level. Both groups had comparable pyrazole levels and thus equal metabolism rates. *In vitro* addition of reduced NADPH (0.25 μM) to isolated rat microsomes caused 200% malonaldehyde elevations. The appearance of peroxidized materials for ethanol-treated rats, following the addition of substrate for NADPH oxidase, suggests that NADPH oxidation lies near the rate determining step for peroxidized lipid formation in microsomal preparations. Azide ion addition to microsomes of control and chronic ethanol-treated rats did not greatly influence NADPH oxidase activity, although malonaldehyde formation was depressed 90% in controls and 65% in ethanol-treated animals. It is suggested that lipid peroxidation did not appear to be irreversibly linked to NADPH oxidation.

0133 EFFECTS OF PYRAZOLE ON ETHANOL-INDUCED CHANGES IN HEPATIC TRIGLYCERIDE AND GLYCEROL-1-PHOSPHATE CONTENTS AND ON ESTERIFIED AND NON-ESTERIFIED FATTY ACIDS IN THE BLOOD. *(E.)*

Estler, C. J. (Inst. Pharmacol., Univ. Erlangen-Nuremberg, Erlangen, Germany). *Res. Exp. Med. (Berl.)* 163(2):95-100, 1974.

The effects of ethanol and/or pyrazole administration to 3 groups of female NMRI mice on esterified and non-esterified fatty acids in the blood and on the amount of triglycerides, glycerol-1-phosphate, and dihydroxyacetone phosphate in the liver were examined following acute ethanol administration. Mice receiving 4 mg/g ethanol i.v. showed rapid accumulation (within 2 hr) of triglycerides in the liver, with levels increasing from 12.97 to 26.89 µval/ml. Glycerol-1-phosphate increased from o.23 to 0.88 M/g, while dihydroxyacetone phosphate did not show a statistically significant decrease. Nonesterified fatty acids (blood) were 0.002 µM/g; these were increased 0.05 µval/ml over control values and esterified fatty acids (blood) decreased by 1.45 µval/ml. Mice receiving 340 µg/g pyrazole i.p. 2.25 hr presacrifice did not show significant differences in these blood and liver parameters. Mice pretreated with with 340 µg/g pyrazole i.p. 15 min prior to ethanol treatment (4 mg/g, i.v.) showed in comparison to pyrazole-only mice a 0.05 µval/ml increase in nonesterified fatty acids, increases of 2.42 µval/ml and 13 mg/g for esterified fatty acids and triglycerides, resp., and decreases in glycerol-1-phosphate and dihydroxyacetone phosphate from 0.22 µM/g and 0.027 µM/g, resp. to 0.16 and 0.021 µM/g, resp. Alcohol-induced lipolysis appeared to be caused by ethanol alone since the nonesterified fatty acids in the blood also rose in pyrazole-pretreated animals in which the formation of acetaldehyde should be negligible. It was concluded that the initial phase of hepatic steatosis produced by intoxicating doses of ethanol is due to factors other than the alteration of the liver cell's redox state.

0134 HEPATIC REDOX STATE: ATTENTUATION [SIC!] OF THE ACUTE EFFECTS OF ETHANOL INDUCED BY CHRONIC ETHANOL CONSUMPTION. *(E.)* Domschke, S.; Domschke, W.; Lieber, C. S. (Dep. Med., Univ. Erlangen-Nuremberg, Erlangen, Germany). *Life Sci.* 15(7):1327-1334, 1974.

The effects of an acute dose of a diet containing ethanol (3 g/kg) on hepatic redox state was compared in rats fed ethanol for 25 days and in their littermates given isocaloric carbohydrate. In both groups, cytoplasmic and mitochondrial redox states of pyridine nucleotides shifted to a more reduced level (decreased NADP/NADPH ratio), but the changes were much less extensive in rats chronically fed ethanol. This metabolic adaption may reflect the oxidation of ethanol by a pathway not involving alcohol dehydrogenase, such as the microsomal ethanol oxidizing system, which increases in activity after chronic ethanol ingestion.

0135 ETHANOL AND DRUG METABOLISM IN MOUSE LIVER MICROSOMES SUBSEQUENT TO LIPID PEROXIDATION-INDUCED DESTRUCTION OF CYTOCHROME P-450. *(E.)* Vastis, K. P.; Kowalchyk, J. A.; Schulman, M. P. (Univ. Illinois Coll. Med., Chicago). *Biochem. Biophys. Res. Commun.* 61(1):258-264, 1974.

In vitro studies were undertaken to determine the effect of NADPH-induced peroxidation on the capacity of microsomes to catalyze the NADPH-dependent oxidation of ethanol. Preincubation of mouse liver microsomes with NADPH resulted in malondialdehyde formation, destruction of cytochrome P-450, and decreased rates of aniline hydroxylation and N-demethylation of aminopyrine and ethylmorphine. These phenomena were more pronounced in phosphate than in Tris buffer. No reduction in rates of NADPH-linked oxidation of ethanol or in the activities of NADPH oxidase and NADPH-cytochrome c reductase was observed. While addition of EDTA to preincubation mixtures prevented lipid peroxidation, loss of cytochrome P-450, and inactivation of the drug-metabolizing capacity of microsomes, it did not alter ethanol oxidation rates and the activities of NADPH oxidase and NADPH-cytochrome c reductase. These findings argue against the involvement of cytochrome P-450 in the microsomal ethanol-oxidizing system.

0136 THE EFFECTS OF SUBSTRATES OF MIXED FUNCTION OXIDASE ON ETHANOL OXIDATION IN RAT LIVER MICROSOMES. *(E.)* Hildebrandt, A. G.; Speck, M.; Roots, I. (Inst. Clin. Pharmacol., Free Univ. Berlin, Germany). *Naunyn Schmiedebergs Arch. Pharmacol.* 281(4):371-382, 1974.

The effects of aminopyrine and ethylmorphine on reduced NADPH and oxygen-dependent ethanol oxidation in rat liver microsomes were studied in male Sprague-Dawley rats. Animals were given 80 mg/kg body weight of phenobarbital 72, 60, 48, and 24 hr prior to decapitation for induction of microsomal enzymes. Studies of the rate of formation of acetaldehyde from 50 mM ethanol with isolated microsomal suspensions revealed that in the presence of excess catalase both aminopyrine (8 mM) and ethylmorphine (8 mM) stimulated ethanol oxidation (25 and 26%, resp.). In the absence of catalase, the control activity of the microsomal suspensions was decreased by 39%, and the presence of either substrate at the above concentrations inhibited the rate of acetaldehyde formation by 19 and 38%, resp. The addition of azide to the microsomes in the absence of catalase resulted in a 72% inhibition of acetaldehyde formation which was potentiated by aminopyrine and ethylmorphine to 75 and 87%, resp. These effects were not observed when methanol was used as a substrate, demonstrating that the inhibitions were specific for microsomal ethanol oxidation. Excess catalase plus aminopyrine resulted in strong inhibition of acetaldehyde formation at low ethanol concentrations (below about 20 mM) and a stimulation of the aldehyde's formation at high concentrations (30-140 mM) of ethanol. Lineweaver-Burk plots of acetaldehyde formation *versus* ethanol concentration indicated the simultaneous action of 2 enzymes functional in ethanol oxidation. The results are consistent with the observation that microsomal ethanol oxidation cannot be accounted for solely by catalase activity and provide evidence for the existence of a microsomal ethanol oxidizing enzyme system.

0137 REDUCED GLUCAGON INDUCTION OF TYROSINE AMINOTRANSFERASE IN PERFUSED LIVERS AFTER ETHANOL TREATMENT. *(E.)* Morland, J. (Univ. Oslo, Norway). *Biochem. Pharmacol.* 23(23):3239-3246, 1974.

Male Wistar rats (250-290 g body weight) were given ethanol for 7 weeks to provide either 22 or 35% of the total calories while sucrose replaced ethanol isocalorically in two respective control groups. Ethanol treatment did not influence basal hepatic tyrosine aminotransferase activity. When the livers were isolated and perfused in the presence of glucagon for 3 hr, the subsequent increase of tyrosine aminotransferase activity was reduced to approximately 70% in livers from animals treated with ethanol. This reduction was probably caused by reduced enzyme synthesis, since no action could be found on enzyme activation, degradation or leakage. Cyclic AMP levels in the livers were not affected by previous ethanol treatment. The reduced tyrosine aminotransferase synthesis seems therefore to be independent of changes in the hormone receptor or in the accumulation of cyclic AMP in the liver after glucagon. General protein synthesis, as determined by the rate of incorporation of isotopically labeled amino acid precursor, was not influenced by ethanol treatment in livers perfused with glucagon.

0138 EFFECT OF AN INTOXICATING DOSE OF ETHANOL OR ISOPROPANOL ON THE INCORPORATION OF [1-^{14}C] PALMITATE INTO RAT LIVER AND BLOOD LIPIDS.

(E.) Beauge, F.; Clement, M.; Nordmann, J.; Nordmann, R. (INSERM, Salpetriere Hosp., Paris, France). *Biomedecine* 21(9):386-389, 1974.

The effect of acute ethanol or isopropanol administration (6 g/kg body weight by stomach intubation) on [1-^{14}C] palmitate incorporation into hepatic and blood plasma triglycerides and phospholipids was studied in fasting female Wistar rats. Ethanol produced no significant alteration in the specific activity or concentration of liver plasma triglycerides or phospholipids compared to controls. Isopropanol also had no effect on liver and plasma triglyceride and phospholipid concentration. It did, however, produce a 50% decrease in hepatic triglyceride and phospholipid specific activity and a 90% decrease in serum specific activity. These results indicate that isopropanol, but not ethanol, inhibits release of triglycerides and phospholipids from the liver into serum. Thus, impaired hepatic triglyceride secretion does not appear to be a factor in the development of ethanol-induced fatty liver.

0139 BIOSYNTHETIC PATHWAYS AND TURNOVER OF INDIVIDUAL BILIARY PHOSPHATIDYLCHOLINES DURING METABOLISM OF [1,1-$^{2}H_{2}$] ETHANOL IN THE RAT.

(E.) Curstedt, T.; Sjovall, J. (Karolinska Inst., Stockholm, Sweden). *Biochim. Biophys. Acta* 369(2):173-195, 1974.

Incorporation of deuterium into different positions of individual molecular species of biliary phosphatidylcholines was determined in bile fistula rats given i.p. [1,1-$^{2}H_{2}$]ethanol at a constant rate for 24 hr. The distribution of deuterium between the different positions of the glycerol moiety was the same for all major molecular species. The deuterium excess in phosphatidylcholine molecules synthesized *de novo* was calculated; the values obtained were the same for all molecular species analyzed and remained constant throughout the experiment. The deuterium excess was 35-55 atom % at C-2, 18-20 atom % at C-3 and 8-10 atom % at C-1. Administration of glucose and fructose decreased the deuterium excess at C-3 to 13-15 and 2-4 atom %, resp., but did not change it at C-1 or C-2. It was concluded that all molecular species shared the same precursor pools of dihydroxyacetone phosphate and pyridine nucleotide, and that these pools were closely coupled to ethanol oxidation. The deuterium labeling at C-3 compared with that of potential precursors, as well as the effects of glucose and fructose on the labeling at C-3, indicated that at least 65-70% of the glycerol moieties of the phosphatidylcholines were formed from malate *via* a gluconeogenetic pathway. About 20-30% of the palmitoyl residues were synthesized *de novo*. This value increased to 31-64% when glucose was administered and to 79-100% when fructose was given. This change of origin was accompanied by a marked increase of the 1-palmitoyl-2-palmitoleoyl, 1-palmitoyl-2-oleoyl, and 1-palmitoleoyl-2-oleoyl species, and a decrease of species having linoleoyl or arachidonoyl residues at C-2. The deuterium excess of the NADPH pool used in palmitic acid synthesis was calculated to be 5-10 atom %. The rates of deuterium incorporation indicated the presence of at least two pools of phosphatidylcholines with widely different turnover. The apparent half-life times of the glycerol moiety of molecular species in the pool having a rapid turnover varied between about 1 hr (1,2-dipalmitoyl species) and about 8 hr (1-stearoyl-2-linoleoyl species). The apparent half-life times of 1-palmitoyl residues in different molecular species were about 4 and 10 hr in rats given glucose and fructose, resp. The values were the same for all species studied, indicating that labeled palmitoyl residues in different molecular species were derived from the same palmitic acid pool.

0140 EFFECT OF ETHANOL AND FRUCTOSE ON GALACTOSE ELIMINATION IN RAT.

(E.) Keiding, S. (Rigshosp., Copenhagen, Denmark). *Scand. J. Clin. Lab. Invest.* 34(1):91-96, 1974.

The effect of ethanol and fructose on galactose elimination has been studied in rats. Nephrectomized female Wistar rats received a bolus of galactose (0.04-0.4 mM) *via* the jugular vein followed by continuous infusion (40-180 µM/hr) over a 60 min period. Either ethanol or fructose were given as a single i.v. bolus (1.0 and 1.1 mM, resp.) immediately before the galactose bolus followed by continuous infusion (0.76 and 1.2 mM/hr, resp.) mixed with the galactose. Arterial ethanol and fructose concentrations during infusion were 7 and 6 mM/liter, resp. The galactose elimination capacity, defined as the elimination rate at blood galactose concentrations between 2 and 7 mM/liter, during ethanol infusion was, on the average, 80 µM/hr per whole animal, or two-thirds the value observed in comparable experiments without ethanol. Fructose did not change the galactose elimination capacity. The galactose elimination during ethanol infusion could be described by Michaelis-Menten kenetics. The calculated V_{max} was significantly lower than that obtained in experiments without ethanol. The pattern of the metabolites observed in liver tissue is compatible with an inhibitory effect of ehtanol on UDP-glucose-4-epimerase, but with the phosphorylation of galactose by galactokinase as the rate-limiting step, inhibited by accumulation of galactose-1-phosphate. The galactose-1-phosphate concentration observed indicates a considerably smaller K_i for the inhibition of galactokinase by galactose-1-phosphate towards galactose than that observed by *in vitro* studies.

0141 INCREASE IN HEPATIC NAD LEVEL—ITS EFFECT ON THE REDOX STATE AND ON ETHANOL AND ACETALDEHYDE METABOLISM.

(E.) Erikson, C. J. P. (Res. Lab., State Alcohol Monop., Helsinki, Finland). *FEBS Lett.* 40(2):317-20, 1974.

Studies were conducted in male Wistar rats to determine the effects of liver NAD levels on ethanol and acetaldehyde metabolism. Experimental rats received an i.p. injection of nicotinamide (500 mg/kg) followed 8 hr later by i.p. ethanol (1.18 g/kg). Ethanol caused about a 50% increase in liver NADH and a slight decrease in NAD in nicotinamide-pretreated rats, values insignificantly different from those of non-nicotinamide-pretreated controls. Both total and free liver NADH:NAD ratios were increased 4-fold following ethanol injection in both experimental and control animals. The cytoplasmic free NADH:NAD ratio as calculated from the lactate:pyruvate ratio showed no response to increased total NAD either before or during ethanol metabolism. These results could be due either to accumulation of NAD in some compartment other than the cytosol, or to release of bound NADH in the cytosol. No effect on ethanol elimination in rats was obtained by increasing the hepatic NAD level with nicotinamide. However, blood acetaldehyde concentration was significantly lowered in nicotinamide-pretreated animals. The decreased acetaldehyde levels could be due to stimulation of hepatic acetaldehyde oxidation by NAD or to the decreased ethanol oxidation state shown to exist in these rats.

0142 TRANSFER OF DEUTERIUM FROM [1-$^2H_2$]ETHANOL TO KREBS CYCLE AND RELATED ACIDS OF RAT LIVER IN VIVO.

(E.) Cronholm, T.; Matern, H.; Matern, S.; Sjovall, J. (Karolinska Inst., Stockholm, Sweden). *Eur. J. Biochem* 48(1):71-80, 1974.

The utilization in intermediary metabolism of hydrogens derived from C-1 in ethanol was studied in male Sprague-Dawley rats following 2 i.p. or i.v. injections of [1-$^2H_2$]ethanol (1.0 g/kg body weight) 2 hr apart. A gas chromatographic-mass spectrometric method was developed and used to measure the deuterium content in individual positions of lactate, malate, 3-hydroxybutyrate, citrate, succinate and fumarate isolated from freeze-clamped livers of rats metabolizing [1-$^2H_2$]ethanol (95 atoms% ^2H excess) at a maximal rate. A steady state of ^2H-labeling was reached within a few minutes. 3-Hydroxybutyrate contained only 1-2 atoms% of deuterium which was interpreted to indicate that intramitochondrial NADH was essentially unlabeled due to exchange with protons in the NADH dehydrogenase reaction. A low labeling of lactate, 17 atoms%, indicated that the exchange of hydrogens in cytosolic NADH with unlabeled substrates and water was 4 times higher than the rate of ethanol oxidation. Since intramitochondrial oxidation of NADH is not rate limiting, the presence of labeled NADH in the cytosol may indicate that transfer of hydrogen through the mitochondrial membrane is a rate-limiting step. As expected from the reversible reactions catalyzed by fumarate hydratase and malate dehydrogenase the deuterium excess at C-2 and C-3 of malate and fumarate were about the same (20 atoms%). Citrate had a deuterium excess of about 9 atoms%, assuming that only 1 hydrogen was labeled. Succinate contained very little deuterium. The labeling of citrate may thus be due either to incorporation of oxaloacetate labeled at C-3 or to labeling of the same hydrogen in a reaction catalyzed by isocitrate dehydrogenase. The results indicate that both malate and isocitrate are potential sources of labeled NADPH during oxidation of [1-$^2H_2$]ethanol, and that these 2 routes are not completely equilibrated under the experimental conditions.

0143 UTILIZATION OF THE CARBON AND HYDROGEN ATOMS OF ETHANOL IN THE BIOSYNTHESIS OF STEROIDS AND BILE ACIDS.

(E.) Cronholm, T.; Burlingame, A. L.; Sjoval, J. (Karolinska Inst., Stockholm, Sweden). *Eur. J. Biochem.* 49(3):497-510, 1974.

Male Sprague-Dawley rats with bile fistulas were given i.p. injections of [1-$^2H_2$]ethanol, [2-$^2H_3$]ethanol and [1-^{13}C,1-$^2H_2$]ethanol (10% solutions, 0.5-1.5 ml hourly for 23-24 hr) under conditions ensuring a maximal rate of oxidation. Cholesterol, cholic acid, chenodeoxycholic acid and 3β,11β,21-trihydroxy-6α-pregnan-20-one were isolated from bile collected at intervals during the experiment. The fraction of molecules containing different numbers of heavy isotope atoms was measured by gas chromatography, mass spectrometry, and computer techniques. The results were used to determine the origin of the cholesterol pools used as precursors for the different compounds isolated from bile. The bile acids were found to be formed from a cholesterol pool, the turnover of which was about 5 times more rapid than that of the cholesterol pool used for biliary excretion. The cholesterol pools used for biliary excretion and as corticosterone precursor seemed to be in equilibrium. The acetyl groups derived from ethanol were introduced into the steroids without exchange of hydrogens at C-2, and the acetyl-coenzyme A (CoA) pool used as precursor did not exchange with acetyl groups in, e.g., citrate or fatty acids. A difference in incorporation of [2-$^2H_3$]acetyl groups and [1-^{13}C] acetyl groups was interpreted to be due to an isotope effect. Ethanol contributed about 45% of the acetyl-CoA pool used as precursor of cholesterol and bile acids. Deuterium from [1-$^2H_2$]ethanol was incorporated in many positions of all the steroids. If it is assumed that the incorporation is mediated by NADPH, the deuterium excess of the hydrogens introduced was about 10 atoms%. The contribution *via* different pathways of an important part of the hydrogen and carbon atoms in cholesterol, bile acids and corticosteroids provides possible mechanisms by which ethanol may affect the biosynthesis and metabolism of steroids.

0144 EFFECT OF 1,3-BUTANEDIOL ON HEPATIC FATTY ACID AND METABOLITE LEVELS IN THE RAT. *(E.)* Romsos, D. R.; Belo, P. S.; Leveille, G. A. (Dep. Food Sci. Hum. Nutr., Michigan State Univ., East Lansing). *J. Nutr.* 104(11):1438-1445, 1974.

The effect of 1,3-butanediol on hepatic fatty acid synthesis and metabolite levels was examined in male Sprague-Dawley rats. Hepatic fatty acid synthesis, as estimated by histochemical and biochemical techniques, was depressed in rats fed 1,3-butanediol. An i.p. injection of 1,3-butanediol (800 mg) increased blood glucose levels but did not affect hepatic fatty acid synthesis. Addition of 10 mM 1,3-butanediol to the incubation buffer depressed glucose, but not acetate, conversion to fatty acids by rat liver slices. Methylene blue inhibition of hepatic fatty acid synthesis was partially reversed by the addition of 1,3-butanediol to the incubation buffer. Hepatic β-hydroxybutyrate levels and the β-hydroxybutyrate: acetoacetate ratio were increased when 1,3-butanediol was fed (18 or 36% dietary energy). Lactate and pyruvate levels were lower in freeze-clamped liver preparations from rats fed 1,3-butanediol than those observed in control animals. Further, the lactate:pyruvate ratio was increased, suggesting that the hepatic cytoplasmic NADH:NAD+ ratio was increased. Hepatic long-chain acyl coenzyme A (CoA) levels were also increased when 1,3-butanediol was fed. It is suggested that the shift in the cytoplasmic redox state and the increase in hepatic long-chain acyl CoA levels are involved in the decrease in hepatic fatty acid synthesis observed when rats are fed 1,3-butanediol.

0145 BIOCHEMICAL CHANGES INDUCED BY ETHYL ACETATE IN BLOOD AND LIVER OF RAT. *(E.)* Seth, P. K.; Srivastava, S. P. (Ind. Toxicol. Res. Cent., Lucknow, India). *Bull. Environ. Contam. Toxicol.* 12(5):612-616, 1974.

The effects of ethyl acetate (1.0 mg/kg/day for 8 days) on blood and liver pyruvic acid content and on hepatic enzyme activity were studied in 10 male albino rats. Both liver and blood pyruvate concentration increased about 2-fold gradually from the 1st to the 7th day of ethyl acetate injection. Associated with this were both a decrease in liver glycogen from 3.98 to 2.21 µg/g wet weight and an increase in both blood (9.20 to 17.38 mg%) and liver 121.00 to 283.40 µg/g wet weight) lactic acid, also changes of about 2-fold. The increased blood and hepatic pyruvate levels in ethyl acetate-treated rats may have been due to an increase rate of glycolysis since hepatic glucose-6-phosphatase activity was unchanged. Adenosine triphosphatase, 5'-nucleotidase and acid phosphatase activities were not significantly changed, suggesting that hydrolysis of phosphate esters is generally unaffected by ethyl acetate.

0146 EFFECTS OF TETRACYCLINE ON ULTRASTRUCTURE AND LIPOPROTEIN SECRETION IN THE RAT HEPATOCYTE. *(E.)* Gray, J. E.; Weaver, R. N.; Skinner, P.; Matthews, J.; Day, C. E.; Stern, K. (Res. Lab. Upjohn Co., Kalamazoo, Mich.). *Toxicol. Appl. Pharmacol.* 30(2):317-332, 1974.

Ultrastructural and biochemical studies were conducted to definitively characterize the progressive morphological changes which occur at near-maximum tolerated levels of i.p. administered tetracycline in Sprague-Dawley rats. Fat droplets, 0.1-0.5 µm, accumulated in the space of Disse of hepatocytes in rats treated with 300 mg/kg. This change occurred in both pregnant and unbred females and in males but was not observed in similar rats treated with 100 mg/kg tetracycline which showed typical steatosis. Ultrastructural changes in mitochondria, and rough and smooth endoplasmic reticulum were similar to those previously reported. Uptake of i.v. administered palmitic [9-10-^{3}H]acid in rats treated with 300 mg/kg was not appreciably impaired. One hour after an injection of 300 mg/kg, the antibiotic concentration was 10 times greater in the liver than in the serum. From 1-6 hr the concentrations increased from roughly 300 to 800 µg/g of liver. In rats treated with 100 mg/kg, no concentrations above 200 µg/g were observed during a 48-hr postinjection period. Under *in vitro* conditions, tetracycline complexed with lipoprotein in a precipitate when a concentration greater than 200 µg/ml was obtained in rat blood serum. In the hepatocytes of rats treated with 300 mg/kg it was presumed that as the antibiotic concentration rose above 200 µg/g nascent very low density lipoprotein complexed rapidly with it. The complexed lipoprotein was channeled in dilated smooth endoplasmic reticulum in the manner of liposomes to the sinusoidal surface and discharged from vesicles into the space of Disse. The plasma membrane of the hepatocyte showed loss of microvilli and surface distortion. The space of Disse became distended with insoluble fat droplets from 6 hr to 3 days after injection, due to the passage of fine osmiophilic droplets or liposomes from the sinusoidal surface of the hepatocyte.

0147 ACUTE HEPATOTOXIC EFFECTS OF MIREX IN THE RAT. *(E.)* Kendall, M. W. (Univ. Mississippi Sch. Med., Jackson). *Bull. Environ. Contam. Toxicol.* 12(5):617-620, 1974.

Light microscopic studies were conducted to study the acute hepatotoxic effects of Mirex, a chlorinated polyhalogen insecticide. Female Sherman rats received either a single lethal dose for 50% survival of Mirex (365 mg/kg) by i.p. injection or were fed *ad libitum* a total of 365 mg/kg Mirex in their diet over a 12 day period. I.p. administration produced apparent glycogen depletion with hepatocyte enlargement, periportal liposis with central necrosis, and infrequent areas of surface necrosis in livers after 12 days. Oral feeding produced all these changes except for surface necrosis. Clinically, rats fed p.o. exhibited lethargy, loss of hair and weight, and tremor and diarrhea, all previously described symptoms of Mirex toxicity. The pattern of periportal liposis seems to be fairly specific for Mirex toxicity in rats.

0148 CATION MOVEMENT DURING CARBON DISULPHIDE-INDUCED LIVER INJURY. *(E.)* Butler, W. H.; Hempsall, V.; Magos, L. (Med. Res. Counc. Lab., Carshalton, England). *J. Pathol.* 113(1):53-60, 1974.

The changes in liver water content and levels of Na+ and K+ occurring after acute exposure to carbon disulfide (4 mg/liter for 4 hr) were studied over a 7-day period in phenobarbital-pretreated starved male albino rats. Compared to controls, hepatocyte water content showed a rapid increase, reaching a maximum of about 2.8 kg/kg dry weight at 12 hr after carbon disulfide exposure and returning to normal after 48 hr. Associated with this and following the same time course, there was an increase in Na+ and K+ content related to liver dry weight. The concentration of Na+ and K+, when expressed in relation to the total liver water, did not change. It was suggested that carbon disulfide causes dissolution of the smooth endoplasmic reticulum, thus forming an osmotically active species resulting in the increased water content. Normal Na+ and K+ concentrations are maintained by an intact Na+ pump. During recovery from carbon disulfide, the damaged cell membrane is possibly included in autophagic vacuoles and is no longer available to the cell.

0149 FATE OF ARSENIC AFTER PARENTERAL ADMINISTRATION TO RATS, WITH PARTICULAR REFERENCE TO EXCRETION VIA BILE. *(E.)* Cikrt, M.; Bencko, V. (Fac. Med. Hyg., Charles Univ. Prague, Czechoslovakia). *J. Hyg. Epidemiol. Microbiol. Immunol. (Praha)* 18(2):129-136, 1974.

Biliary arsenic excretion was studied in fasting female Wistar rats for 24 hr following i.v. administration of ^{74}As-labeled sodium arsenate or arsenite (100 μg As). Total 24 hr biliary arsenic excretion was 10.82% and 1.42% of the administered doses of arsenite and arsenate, resp. The highest rate of excretion occurred during the 1st 15 min after injection in both cases. Urinary arsenic excretion over the 24-hr period was significantly lower for arsenite (6.00%) than for arsenate (29.39%). Arsenic content as determined by chromatographic analysis of tissue homogenates was higher in liver and kidneys after arsenite injection and in urine and erythrocytes after arsenate administration. Significant differences between the 2 valency forms were not found in either the wall or the content of the different levels of the gastrointestinal tract. It was thus concluded that the biliary excretion of arsenic is significant, especially following arsenite administration. The differences in the rate of excretion of the 2 valency forms may be due to differences in the binding pattern to the different bile components.

0150 MECHANISMS OF ACUTE HEPATIC TOXICITY: CHLOROFORM, HALOTHANE, AND GLUTATHIONE. *(E.)* Brown, Jr., B. R.; Sipes, I. G.; Sagalyn, A. M. (Univ. Arizona Coll. Med., Tucson). *Anesthesiology* 41(6)554-561, 1974.

Hepatotoxic response to chloroform and halothane anesthesia was studied in male Sprague-Dawley rats pretreated with 1 mg/ml p.o. phenobarbital. The effect of diethyl maleate pretreatment, particularly on glutathione level was also investigated. Hepatic glutathione content in phenobarbital-pretreated animals was decreased 70% after 2 hr of exposure to 0.5% chloroform anesthesia and 83% after 2 hr exposure to 1% chloroform. Glutathione concentrations were not altered following chloroform anesthetization of controls not receiving phenobarbitol pretreatment. Neither controls nor pretreated animals showed glutathione changes after treatment with 1% halothane. Mortality rates at 18 hr were 20% for phenobarbital-pretreated rats anesthetized with 0.5% chloroform and 80% with 1.0% chloroform. No deaths occurred in controls receiving chloroform or in any of the animals receiving halothane. Marked destruction of microsomal electron transfer components was observed in the phenobarbital-pretreated animals receiving chloroform. Chloroform in the phenobarbital pretreated animals caused marked destruction of cytochrome P-450 and reduced nicotinamide adenine dinucleotide phosphate cytochrome c reductase. These animals also exhibited increased amounts of microsomal cytochrome b$_5$. Diethyl maleate administration produced rapid reduction in glutathione content in all groups of animals. Two hr after i.p. administration of 0.6 ml/kg, the mean glutathione level in rats was 0.474 μg/mg liver as compared to a control value of 2.15 μg/mg liver. Chloroform anesthesia (0.5%) in the presence of glutathione depletion resulted in increased diene conjugates and cytochrome P-450 destruction in animals not receiving phenobarbital pretreatment. Starvation (48 hr) was also found to increase the sensitivity of the liver to toxic actions of chloroform. *In vitro* experiments revealed that microsomal protein from livers of phenobarbital-pretreated animals bound chloroform metabolites to a much greater extent than did microsomal protein from non-induced livers. Addition of glutathione (2mM) markedly inhibited the binding of these metabolites by phenobarbitol-induced microsomes and reduced binding in noninduced microsomes.

0151 INTERACTION OF VOLATILE ANESTHETICS WITH RAT HEPATIC MICROSOMAL CYTOCHROME P-450. *(E.)* Takahashi, S.; Shigematsu, A.; Furukawa, T. (Fac. Med., Kyushu Univ., Fukuoka, Japan). *Anesthesiology* 41(4):375-379, 1974.

The effects of halothane, methoxyflurane, and enflurane on hepatic microsomal suspensions from adult male Wistar rats were spectrophotometrically studied to investigate their interaction with cytochrome P-450. Hepatic microsomal enzymes were induced by i.p. phenobarbital pretreatments (80 mg/kg/day, 4 days). Addition of each of the anesthetics (about 6 mM) to the suspensions caused the appearance of a trough at 420 mμ and an absorption band at 385 mμ (type I spectral change), indicative of an interaction between cytochrome P-450 and the anesthetics. Diethyl ether had no effect. The 3 anesthetics competitively inhibited the spectral change produced by addition of 1.0 mM hexobarbital (type I substrate), while the spectral change (trough at 393 mμ and absorption band at 430 mμ) caused by aniline (type II substrate) was increased in amplitude by these volatile anesthetics. N-demethylase activity of aminopyrine (5 mM; type I substrate) was inhibited and the hydroxylase activity of aniline enhanced by the anesthetics. The biotransformation of all 3 anesthetics appeared to be dependent on interaction with cytochrome P-450. Furthermore, induction of microsomal mixed-function oxidases appeared to change the rates of metabolism of each of the anesthetics.

0152 FURTHER STUDIES CONCERNING THE EFFECTS OF CLOFIBRATE ON RESPIRATION AND OXIDATIVE PHOSPHORYLATION OF RAT LIVER MITOCHONDRIA.

(E.) Mackerer, C. R.; Haettinger, J. R. (Searle Lab., Chicago, Ill.). *Biochem. Pharmacol.* 23(23):3331-3345, 1974.

The hypolipidemic agent, clofibrate (>0.1 μM/mg protein) administered *in vitro*, inhibited rat liver mitochondrial respiration at 2 sites within the respiratory chain. One site was between the interaction of NADH with NADH dehydrogenase and the point at which electrons from succinate oxidation enter the electron transport chain; another, less sensitive site, was between the interaction of succinate with succinate dehydrogenase and cytochrome c. In addition to these specific sites, clofibrate inhibited respiration by causing a depletion of pyridine nucleotides that was accompanied or followed by large-amplitude, non-energy-linked swelling. Clofibrate uncoupled oxidative phosphorylation at coupling sites II and III but not at site I. The concentrations required to cause loss of pyridine nucleotides were lower than those required to inhibit at the specific sites. *p*-Chlorophenoxyisobutyrate (CPIB) also inhibited succinate and β-hydroxybutyrate-linked respiration and uncoupled oxidative phosphorylation but at much higher concentrations (50% inhibition of β-hydroxybutyrate oxidation at about 3.7 μM/mg of protein) than were required of clofibrate (50% inhibition of β-hydroxybutyrate oxidation at about 0.17 μM/mg of protein). Clofibrate administration to rats (100 and 300 mg/kg p.o. daily for 1 week) lowered serum lipid levels and increased the liver size, the amount of mitochondrial protein/g of liver, and the oxygen consumption of liver slices. However, mitochondria, isolated from livers of the treated rats, respired normally. A single administration of clofibrate (100 or 300 mg/kg, p.o.) did not affect liver slice respiration.

0153 SYNERGISM BETWEEN AMMONIA AND FATTY ACIDS IN THE PRODUCTION OF COMA: IMPLICATIONS FOR HEPATIC COMA.

(E.) Zieve, F. J.; Zieve, L.; Doizaki, W. M.; Gilsdorf, R. B. (Minneapolis VA Hosp., Minnesota). *J. Pharmacol. Exp. Ther.* 191(1): 10-16, 1974.

Male Holtzman rats and mongrel cats were used to study the synergistic action of ammonia and fatty acids in producing coma. An i.p. dose of 1.45 mM NH_4^+ caused coma in 50% of rats receiving such treatment, and a 1.7 mM dose produced coma in 100% of the animals. The maximum dose of NH_4^+ not producing coma in any animal was 1.2 mM i.p. The addition of 0.4 mM octanoate (i.p.) lowered the coma-producing NH_4^+ dose (in 50% of the rats) to 0.69 mM. Coma incidence rose from 0-100% when the maximum subcoma doses of NH_4^+ (1.2 mM i.p.) and octanoate (0.4 mM i.p.) were given simultaneously. A converse experiment with rats showed similar effects, with 1.0 mM NH_4^+ (i.p.) lowering the octanoate dose required for 50% coma incidence from 0.48 to 0.31 mM (i.p.). Measurements of blood ammonia and plasma free fatty acid levels in 136 normal rats receiving various combinations of ammonium chloride and octanoate revealed that coma was produced by ammonium chloride alone at blood ammonia nitrogen concentrations of approximately 2200 μg/100 ml and by octanoate alone at concentrations of approximately 2800 nM/ml. At a Dole free fatty acid concentration of 700 nM/ml, coma occurred when blood ammonia was 1000 μg/100 ml. Similar measurements in cats receiving i.v. combinations of ammonium acetate and octanoate showed almost identical findings. Subcoma doses of representative short, medium, and long chain fatty acids injected i.p. into rats just prior to injection of 1.0 mM ammonium chloride also resulted in the production of coma, with the average blood ammonia rising by at least 1000 μg/100 ml. The longer chain fatty acids were actually more potent than octanoate in this respect. Rats and cats in hepatic coma produced by portacaval shunt and ligation of the hepatic artery showed blood ammonias varying between 900 and 2500 μg/100 ml, with three-fourths of the animals having values below 1500 μg/100 ml. A high curvilinear correlation was observed between blood ammonia and plasma free acids in four-fifths of the animals. The data suggest that in addition to ammonia, fatty acids play a significant role in experimental hepatic coma.

0154 DISTRIBUTION AND FATE OF SYNTHETIC LIPID VESICLES IN THE MOUSE: A COMBINED RADIONUCLIDE AND SPIN LABEL STUDY

(E.) McDougall, I. R.; Dunnick, J. K.; McNamee, M. G; Kriss, J. P. (Stanford Univ. Med. Cent., Calif.). *Proc. Natl. Acad. Sci. USA* 71(9):3487-3491, 1974.

The distribution and fate of single-compartment vesicles, prepared with a spin label (tempocholine chloride) and/or $^{99m}TcO_4$, were studied following i.v. injection into C_3H mice. About 25% of the administered radioactivity was present in the liver 5 min and 30 min after the injection of vesicles composed of phosphatidylcholine and gangliosides, which were sonicated for 5 min (standard preparation). About 10-20% of the radioactivity remained in the circulation. By use of the nonradioactive spin label enclosed within vesicles, intact vesicles were demonstrated in the circulation for 46 min after injection. The distribution of radioactivity from $^{99m}TcO_4^-$ inside vesicles was very different from that of free $^{99m}TcO_4^-$ or of ^{99m}Tc sulfur colloid. Increase in the length of sonication or incorporation of cholesterol into the wall of the vesicles enhanced hepatic levels and reduced blood levels of radioactivity. These same manipulations also showed the rate of transfer of $^{99m}TcO_4^-$ out of vesicles in dialysis experiments *in vitro.* addition of phosphatidic acid, phosphatidylethanolamine, or phosphatidylserine to the standard constituents did not greatly alter the distribution of radioactivity *in vivo* but did increase the number and type of active coupling sites on the outside of the vesicle. The results indicate that vesicles might be valuable as carriers of diagnostic or therapeutic agents which might be delivered selectively to various target organs or tissues.

0155 STUDIES ON THE SYNTHESIS OF LIVER PHOSPHOLIPIDS AND THE TURNOVER OF PLASMA PHOSPHOLIPIDS IN PREGNANT RATS USING RADIOACTIVE PALMITATE.

(E.) Schirrmeister, W.; Hummel, L.; Zimmermann, T. (Inst. Pathol. Physiol., Friedrich-Schiller Univ., Jena, Germany). *Acta Biol. Med. Germ.* 32(5):557-560, 1974.

Liver and plasma phospholipids and maternal plasma free fatty acids from 40 pregnant Wistar rats (21 days pregnant) i.v. labeled with ^{14}C-1-palmitate were assayed at various time intervals following injection to obtain the rate of synthesis of liver phospholipid fatty acids and the turnover rate of plasma phospholipid fatty acids. The data were normalized to a constant injected dose of radioactive palmitate (20 x 10^6 cpm) and a body weight of 300 g. The specific activity of liver phospholipids remained constant from 5-120 min following injection of the label into the mother, indicating that the radioactivity accumulated in the liver phospholipids up to 5 min left at an extremely slow (undetectable) rate. There was virtually no radioactivity left in the plasma free fatty acids 5 min after injection of label and thus no more radioactivity to enter the liver phospholipids. It was postulated that a rapid exchange of label occurred between the individual liver phospholipids. A comparison of the amount of free fatty acids esterified to liver phospholipids (1.02 μM) and the turnover rate of plasma phospholipid fatty acids (0.62 μM/min) indicated that only 60% of the plasma free fatty acids esterified to liver phospholipids was secreted by the liver into the plasma. The remaining 40% was apparently channelled after their hydrolysis into other pathways. The turnover time of plasma phospholipid fatty acids was calculated to be 1.21 hr.

0156 EXPERIMENTS ON THE FORMATION OF $^{14}CO_2$ IN HUMAN LIVER BIOPSIES FROM LABELED FATTY ACIDS WITH DIFFERENT CHAIN LENGTH AND DIFFERENT NUMBER OF DOUBLE BONDS.

(Ger.) Fischel, P.; Oette, K. (Med. Clin., Univ. Cologne, Germany). *Res. Exp. Med. (Berl.)* 163(1):1-16, 1974.

The formation of $^{14}CO_2$ from albumin bond 1-^{14}C fatty acids in human liver biopsies was studied. The samples were taken from normal subjects and from patients with pancytopenia, myocarditis, diabetes, alcoholism, hepatitis, hyperbilirubinemia, dermatitis herpetiformis, liver cirrhosis, toxoplasmosis, jaundice, hemolytic anemia, Lofgren's syndrome, porphyria cutanea tarda, fatty liver degeneration, and obesity. Regardless of the chain length and number of double bonds, fatty acids were oxidized in proportion to their concentration in the medium. Short-chain and long-chain fatty acids did not influence each other, and glucose only depressed the oxidation of short-chain fatty acids. Ethanol decreased the oxidation of both long-chain and short-chain fatty acids. The molar oxidation rate was essentially determined by the chain length. Similar results were obtained with rat liver slices. A maximum rate of oxidation was found for C_6 fatty acid. The oxidation rate was lowest for long-chain fatty acids. With the exception of stearic acid, they showed only minor differences. Stearic acid, oxidized much more easily, showed ATP formation rates comparable to those of short-chain fatty acids. In view of the small number of patients, the data obtained were not correlated to specific diseases and diets. Both of these factors were, however, of minor importance in comparison with the influence of the type of the fatty acid.

0157 FAILURE OF ADRENALCORTICOSTEROIDS TO INFLUENCE THE MAJOR MECHANISMS OF HEPATIC CHOLESTEROGENESIS.

(E.) Nervi, F. O.; Dietschy, J. M. (Univ. Texas Southwestern Med. Sch., Dallas). *Biochim. Biophys. Acta* 369(3):351-360, 1974.

Under conditions of carefully controlled dietary intake and cyclic lighting the effect of bilateral adrenalectomy on the alterations in hepatic sterol synthesis caused by diurnal variation in lighting, cholestyramine feeding, fasting i.v. intestinal lipoprotein injection and stress was investigated in female Sprague-Dawley rats. Adrenalectomy caused no alterations in the rate of hepatic CO_2 production or of cholesterol or ketone body synthesis. Cholesterogenesis varied from 255 to 738 nM/g/hr, in the mid-light and mid-dark phases of the light cycle, resp., in control animals; identical variation was found in adrenalectomized animals. Cholestyramine feeding caused a 3-fold increase in hepatic cholesterogenesis in both control and corticosterone-deficient groups. Cholesterol synthesis was markedly suppressed in control rats and in rats with adrenalectomy by fasting for 48 hr and by i.v. injection of intestinal lipoproteins. Finally, stress induced a 10-fold increase in the rate of hepatic cholesterogenesis in both the adrenal-deficient and control animals. These results indicated that adrenalectomized animals responded in an essentially normal manner to all of the major physiological maneuvers tested that are known to affect the rate of hepatic cholesterol synthesis.

0158 REGULATION OF CHOLESTEROL 7α-HYDROXYLATION BY CHOLESTEROL SYNTHESIS IN RAT LIVER.

(E.) Takeuchi, N.; Ito, M.; Yamamura, Y. (Osaka Univ. Hosp., Japan). *Atherosclerosis* 20(3):481-494, 1974.

Hepatic cholesterol 7α-hydroxylation and cholesterogenesis were determined *in vitro* at various time intervals 6 hr after p.o. or i.v. administration of glucose to fasted rats. Glucose administration to fasted rats enhanced cholesterol 7α-hydroxylation as well as fatty acid or cholesterol synthesis in the liver, though significant changes were not demonstrated in the cholesterol content of liver and serum throughout the observed periods. Hepatic cholesterol synthesis, as determined by the rate of incorporation of [1-^{14}C]sodium acetate into liver slices, increased 1 hr after oral glucose ingestion (2 ml/100 g of a 50% solution). On the other hand, cholesterol 7α-hydroxylation, also determined by *in vitro* assay using liver slices, was stimulated 2 hr after oral glucose administration, with a lag phase of 1 hr following the induction of cholesterol synthesis. From the results of the experiments on the effect of glucose ingestion it appeared that cholesterol 7α-hydroxylation was correlated with hepatic cholesterogenesis. Hepatic cholesterogenesis was decreased in triparanol-treated rats (8 mg/day p.o for 7 days) and was not stimulated by glucose administration. Triparanol did not affect cholesterol hydroxylation in the fasted state, but did abolish the stimulatory effect of glucose. Short-term feeding of a high-cholesterol (1.5%) diet, which suppressed hepatic cholesterol synthesis, stimulated cholesterol 7α-hydroxylation. Oral administration of glucose to cholesterol-fed rats still further accelerated hydroxylation. In rats with ligated bile ducts, hepatic cholesterogenesis increased 24 hr after bile-duct ligation while hydroxylation decreased 24 hr after the operation but was stimulated after 72 hr. Glucose ingestion by these rats stimulated both cholesterol synthesis and hydroxylation. It is concluded that increased hepatic cholesterogenesis enhances cholesterol 7α-hydroxylase activity; this activity does not depend upon increased fatty acid or other lipid synthesis, altered bile flow or gastrointestinal factors. Increased dietary cholesterol intake also accelerates hydroxylase activity. These mechanisms may preserve homeostasis in the serum cholesterol level, and an altered balance between these two enzyme systems--anabolic and catabolic--probably induces a change in the size of the body cholesterol pool.

0159 DEMONSTRATION AND SOLUBILIZATION OF AN INHIBITOR OF HEPATIC CHOLESTEROL BIOSYNTHESIS FROM RAT LIVER MICROSOMES. *(E.)* Krzemien, J. R.; Haven, G. T. (Coll. Med., Univ. Nebraska, Omaha). *Biochim. Biophys. Acta* 369(1):70-78, 1974.

Acetone powders were prepared from liver microsomes of Sprague-Dawley rats by a modification of the Linn method. The powder cake was washed with ethyl alcohol and dried *in vacuuo* at room temperature for several hr. The solubilized hepatic fraction was suspended in 0.1 M phosphate buffer, pH 7.0, without the addition of any thiol compound. Any hydroxymethylglutaryl-coenzyme A reductase in the preparation was presumably destroyed by exposure to air during ethanol washing and drying at room temperature in the absence of a thiol compound. In a cell-free homogenate system, the buffer-soluble fraction inhibited incorporation of $^{14}C_2$-acetate into cholesterol in a manner similar to that previously reported for the solubilized renal fraction. In a liver slice system, intact hepatic microsomes from fasted animals inhibited cholesterol synthesis from $^{14}C_2$-acetate significantly more than those from fed rats. In contrast, the inhibitory effects of hepatic microsomal acetone powders from fed and fasted rats appeared identical. In intact animals, the solubilized hepatic microsomal fraction caused an apparent 30% inhibition of cholesterol synthesis and a 34% decrease in labeled plasma cholesterol. The results for this system were not statistically significant possibly because of the large intragroup variability. Further purification and characterization of hepatic and renal microsomal factors is required to determine their importance in the physiologic control of hepatic cholesterol synthesis.

0160 EXPERIMENTAL INVESTIGATIONS OF CHOLESTEROL AND CHOLESTEROL ESTER METABOLISM WITH DIFFERENT PRECURSORS IN RAT LIVER AND HUMAN LIVER BIOPSIES AS A FUNCTION OF THE CARBOHYDRATE-FAT CONTENT OF THE DIET. *(Ger.)* Oette, K.; Phlippen, R.; Frotz, H.; Gheorghiu, T.; Lanckohr, H.; Kupfer, I. (Med. Clin., Univ. Cologne, Germany). *Res. Exp. Med. (Berl.* 163(1):17-30, 1974.

The cholesterol and cholesterol ester metabolism with different precursors were studied in infantile rats and in rat and human liver biopsies as a function of the carbohydrate-fat content of the diet. *In vivo* experiments with rats, using ^{14}C-labeled precursors revealed a great importance of fatty acids as cholesterol precursors in the liver but not in the skeletal muscles, and good oxidizability of stearic acid in the liver. The breakdown products of fatty acids and fructose were preferred precursors of cholesterol in human liver biopsies. The breakdown products of stearic acid were taken up into the cholesterol most intensely. The uptake of fatty acid breakdown products using linoleic acid was not influenced by the fat-carbohydrate content of the diet, but it was proportional to the albumin-bound palmitic acids concentration as demonstrated by rat liver experiments. The high-fat diet caused no increase in the activity of the cholesterol-synthesizing enzyme system. This enzyme system was, however, activated following application of ethanol for 6 days. Considerable changes and variations in the daily diet and in the daily cholesterol uptake caused no changes in the uptake of fatty acid breakdown products in general and of linoleic acid in particular, in cholesterol. The rate of formation of cholesterol esters was low, and the differences between long-chain fatty acids were of minor degree. Small proportions of fatty acids and monosaccharides into cholesterol esters were taken up, and highest absolute uptake was determined for myristic acid. There was no dietary influence on the uptake of ^{14}C-linoleic acid into the cholesterol esters. No preferred synthesis of saturated cholesterol esters was found in human biopsies. The findings indicate little, if any, significance of hepatic cholesterol ester formation for the plasma cholesterol esters.

0161 ORIGIN AND NATURE OF THE PROTEINS OF BILE. II. A COMPARATIVE ANALYSIS OF SERUM, HEPATIC LYMPH AND BILE PROTEINS IN THE DOG. *(E.)* Dive, C.; Nadalini, R. A.; Vaerman, J. P.; Heremans, J. F. (Dep. Intern. Med., Catholic Univ. Louvain, Belgium). *Eur. J. Clin. Invest.* 4(4):241-246, 1974.

The derivation of plasma proteins in bile (except for immunoglobulin A) from the circulation was studied in mongrel dogs. Bile and lymph were collected over a 1/2-hr period, with collection of a blood sample at the mid-time point. The concentrations of individual plasma proteins were determined in the plasma and hepatic lymph by radial immunodiffusion. A biosynthetic labeling method was used in protein excretion studies. After induction of protein deficiency, a donor dog received 75 ml saline containing labeled amino acids (L-tryptophan, L-phenylalanine, L-lysine, L-methionine, and L-leucine). Total radioactivity injected was about 30 mCi. Twelve hr later the donor dog was bled to death and the plasma separated from the collected blood. The radioactive plasma was given to a 2nd dog during a plasmapheresis experiment and 72 hr later, bile, hepatic lymph and blood were collected. For each of the relevant proteins, the specific radioactivity was determined after isolation of the component in the form of a specific immune precipitate. The major plasma proteins in hepatic bile, with the exception of immunoglobulin A, were found to be derived entirely from the plasma. Biliary IgA has two sources, the plasma and local biosynthesis. The transfer of plasma proteins from blood to bile proceeded along 2 parallel pathways, one involving bulk transfer of unmodified plasma, and one based on molecular sieving favoring the transfer of plasma proteins of low molecular weight. The molecular sieve process was completed by the time the plasma proteins reached the interstitial fluid. The sieving membrane was therefore assigned anatomically to the vascular walls, which have the properties of an isoporous membrane with a pore radius of 102 Å. No further molecular sieving took place during the crossing of the second barrier between blood and bile, that is, the epithelial sheet separating interstitial fluid from the bile.

0162 THE BINDING OF NATURAL AND SYNTHETIC DYES TO BOUND PROTEINS OF THE LIVER. *(Cz.)*

Jirsa, M.; Hykes, P.; Schinkmannova, L. (Fac. Gen. Med., Charles Univ., Prague, Czechoslovakia). *Cas. Lek. Cesk.* 112(45):1398-1401, 1973.

Quantities of various dye anions bound *in vitro* to proteins Y and Z in liver cytosol were determined spectrophotometrically. Mixtures of 0.01 ml of 0.06 M dye solutions and 3 ml of liver cytosol obtained from homogenized, centrifuged Wistar rat liver were filtered at least twice through a gel column and the quantity of bound dye was determined by measuring E at 278 nm and E at the absorption maximum for each dye. Depending upon their binding to proteins Y and Z, dyes can be divided into 3 groups. Group (1) consists of dyes that are bound primarily to protein Y and are excreted by the liver. This group includes BSP, phenol tetrachlorophthalein, protoporphyrin, conjugated bilirubin, and taurobilirubin. Group (2) consists of dyes which are bound to about the same extent to proteins Y and Z or to a greater extent by Z. These include iodinated BSP, bengal rose, and bilirubin. Group (3) consists of dyes which are not bound to either protein and includes phenol red. From Kav values the molecular weight of protein Y was calculated to be 37,000 and that of protein Z, 17,000. The failure of phenol red to bind to either Y or Z is attributed to its polar $-SO_3$ group which retards binding, although a $-SO_3$ group on the phenol nuclei has no appreciable effect. Uroporphyrin, which has 8 carboxyl groups, and protoporphyrin, which has 2 carboxyl groups, are bound in the same way. However, the very polar uroporphyrin is excreted in the urine. This is apparently due to the inability of uroporphyrin to cross the bile pole of the liver cell: it diffuses back into the blood and is excreted by the kidneys. It is surprising that some dyes, e.g. iodinated BSP and bengal rose, are bound to a greater extent by protein Z, which is less typical for liver cells, and are also found in other organs, but are still excreted in large quanitities by the liver.

0163 EVIDENCE FOR THE BIOSYNTHETIC DIFFERENCE BETWEEN ISOLATED MITOCHONDRIA AND MICROSOMES FROM GUINEA-PIG AND RAT LIVER REGARDING LYSOPHOSPHATIDIC ACID, PHOSPHATIDIC ACID, CDP-DIGLYCERIDE, PHOSPHATIDYLGLYCEROL, AND CARDIOLIPIN. *(E.)*

Davison, J. B.; Stanacev, N. Z. (Fac. Med., Univ. Toronto, Canada). *Can. J. Biochem.* 52(10):936-939, 1974.

The activities of marker and synthetic enzymes were measured in isolated mitochondria and microsomes from guinea pig and rat liver. Of the 2 marker enzymes studied, the activity of NADPH-cytochrome *c* reductase was higher in guinea pig than in rat liver microsomes, whereas the activity of glucose-6-phosphatase was almost the same in both species. The microsomal content in the mitochondria determined by the 2nd marker enzyme was twice that determined by the 1st. The activity of the synthetic enzyme acyl-coenzyme A (CoA):glycero-3-phosphatase acyltransferase was predominantly in microsomes and was 3 times higher in guinea pig microsomes than in rat liver microsomes. The activity of CDP-diglyceride-glycero-3-phosphate phosphatidyltransferase was much higher in rat liver than in guinea pig mitochondria; it was negligible in microsomes of both species. Activity of CTP:phosphatidic acid cytidyltransferase was predominantly in microsomes in both species. In guinea pig mitochondria, but not in rat liver mitochondria, the activity of acyl-CoA:glycero-3-phosphate acyltransferase paralleled the activity of microsomal marker enzymes in this fraction. In both species activity of mitochondrial CTP:phosphatidic acid cytidyltransferase paralleled the activity of the microsomal marker enzymes in mitochondria. Formation of lysophosphatidic acid is an intrinsic mitochondrial process in rat liver but can be attributed to microsomes in the guinea pig liver. In both guinea pig and rat liver mitochondria, formation of CDP-diglyceride can be attributed to microsomal content, while the formation of phosphatidylglycerophosphate, phosphatidylglycerol, and cariolipin is an intrinsic mitochondrial process.

0164 ORNITHINE DECARBOXYLASE ACTIVITY, NUCLEIC ACIDS AND CELL TURNOVER IN THE LIVERS OF PREGNANT RATS. *(E.)*

Campbell, R. M.; Fell, B. F.; Mackie, W. S. (Rowett Res. Inst., Bucksburn, Scotland). *J. Physiol. (Lond.)* 241(3):699-713, 1974.

Nucleic acid content, cell turnover, and ornithine decarboxylase activity were studied in livers of 28 pregnant and 24 nonpregnant rats. All animals received 20 g food/day. Liver weight, as well as total hepatic protein, and RNA and DNA content, increased markedly during the 2nd half of pregnancy when compared to controls. Total RNA concentration increased from the 15th day of gestation. Between the 12th and 18th day of pregnancy liver weight, total RNA, total DNA and mean liver cell nuclear volume increased in parallel at approximately the same rate of 6-10%/day. Ornithine decarboxylase activity, determined by the rate of liberation of $^{14}CO_2$ *in vitro* from carboxyl-labeled ornithine, was enhanced in pregnancy by the 5th day of gestation and rose to peak activity at the 18th day. The mitotic index of hepatic parenchymal cells was elevated in the first and last stages of pregnancy. The later peak in mitosis was associated with a rapid fall in mean nuclear volume. There was histological evidence of cell turnover in the liver of pregnant rats; enlargement of the liver was associated with both hyperplasia and cell deletion. It is concluded that in rats, pregnancy is associated with liver cell enlargement and proliferation, and also with parenchymal cell deletion.

0165 COBALT INDUCTION OF HEPATIC HEME OXYGENASE; WITH EVIDENCE THAT CYTOCHROME P-450 IS NOT ESSENTIAL FOR THIS ENZYME ACTIVITY.

(E.) Maines, M. D.; Kappas, A. (Rockefeller Univ., New York, N.Y.). *Proc. Natl. Acad. Sci. USA* 71(11):4293-4297, 1974.

The effects of cobalt on heme catabolism were studied in male Sprague-Dawley rats. Animals were injected with cobalt chloride (60 mg/kg, s.c.), with methemalbumin (40 μM/kg, i.p.), or with both cobalt chloride and methemalbumin twice at 24-hr intervals. Liver microsomal heme oxygenase and mixed-function oxidase activity were subsequently assayed. Cobalt chloride stimulated hepatic microsomal heme oxidation to levels up to 800% those of saline-injected controls and also caused a 20% decrease in both liver weight and total microsomal protein. In contrast, marked decreases were produced in microsomal oxidation of ethylmorphine (80%), and in cytochrome P-450 (60-70%) and heme (30-50%) contents. Cobalt chloride treatment did not affect heme oxidation by the spleen heme oxygenase system. The rate of heme oxidation by hepatic microsomal enzymes and the microsomal content of cytochrome P-450 were found to be unrelated. This conclusion was reached from studies in which microsomal heme oxygenase activity from cobalt-treated animals could be increased by 900% above control levels in the same microsomal preparation in which cytochrome P-450 content was decreased to spectrally unmeasurable amounts after incubation with 4M urea. The same treatment eliminated ethylmorphine demethylation and decreased microsomal NADPH-cytochrome c reductase (EC 1.6.2.4) activity by 75%. It was concluded: 1) that the hepatic microsomal enzyme system that oxidizes heme compounds is not the same as that which metabolizes drugs; 2) cytochrome P-450 is not essential for the oxidation of heme by liver cells; 3) there is no direct relation between the rate of heme oxidation and the level of NADPH-cytochrome c reductase activity; and 4) the oxidation of heme is protein-dependent and the active proteins are inducible, but are different from those involved in drug metabolism.

0166 EFFECT OF INHIBITORS OF PROTEIN AND RIBONUCLEIC ACID SYNTHESIS ON THE ALTERATION IN BILIARY BILIRUBIN EXCRETION AND NON-ERYTHROPOIETICALLY DERIVED BILIRUBIN SYNTHESIS IN RATS AFTER α-NAPHTHYLISOTHIOCYANATE ADMINISTRATION.

(E.) Triager, G. J.; De Repentigny, L.; Plaa, G. L. (Dep. Pharmacol. Univ. Montreal, Canada). *Biochem. Pharmacol.* 23(20):2845-2856, 1974.

In an attempt to explain the inhibition of α-naphthylisothiocyanate (ANIT)-induced hyperbilirubinemia by inhibitors of protein and RNA synthesis, the effect of cycloheximide, ethionine and actinomycin D on the increased bilirubin formation produced by ANIT (150 mg/kg by gastric lavage) was studied in male Sprague-Dawley rats. Cycloheximide (2 mg/kg i.p.) and ethionine (400 mg/kg i.p.) administered 1 and 2 hr prior to ANIT treatment resp., inhibited the ANIT-induced increase in biliary bilirubin excretion and incorporation of δ-aminolevulinic acid-^{14}C into bilirubin. Cycloheximide was found to be more effective than ethionine in diminishing the stimulation of bilirubin production by ANIT. Pretreatment with actinomycin D (100 μg/kg i.p.) 1 hr prior to ANIT prevented the ANIT-induced increase in biliary bilirubin excretion and produced a decreased but irregular incorporation of δ-aminolevulinic acid-^{14}C into bilirubin. β-Naphthylisothiocyanate (300 mg/kg by gastric lavage), which does not produce hyperbilirubinemia, failed to enhance biliary bilirubin excretion. The results suggest that the enhancement of bilirubin formation by ANIT plays a role in the overall hyperbilirubinemic response seen after ANIT administration. The inhibition of the enhanced bilirubin formation by cycloheximide and ethionine may partially account for their inhibition of ANIT hyperbilirubinemia.

0167 POSTNATAL DEVELOPMENT CHANGES IN HEPATIC BILIRUBIN UDP-GLUCURONYL TRANSFERASE: STUDIES ON THE SOLUBILIZED ENZYME.

(E.) Krasner, J.; Juchau, M. R.; Yaffe, S. J. (State Univ. New York Sch. Med., Buffalo). *Biol. Neonate* 23(5/6):381-390, 1973.

In vitro studies were conducted to compare the kinetic parameters of solubilized and unsolubilized mouse hepatic microsomal bilirubin UDP-glucuronyl transferase during varying stages of postnatal development. Activity of bilirubin glucuronyl transferase in mouse liver homogenates was low at birth, and reached a peak at 14 days of age, 2-3 times greater than adult values. Kinetic studies showed marked differences between microsomes from adult and 14-day-old animals. Michaelis-Menten constants (K_m) were 5.9×10^{-5} M and 4×10^{-4} M resp. at these two ages. K_m values increased from 5.9×10^{-5} M to 6.7×10^{-4} M when enzymes derived from adult animals were solubilized with deoxycholate. In contrast, solubilization did not modify the K_m values in preparations from 14-day-old mice. The newborn K_m value for unsolubilized enzyme was 8.8×10^{-5} M and 6.7×10^{-4} M for the solubilized preparation. Pretreatment of pregnant animals with barbiturates to induce enzymic activity was necessary for the kinetic studies in the newborn. These findings indicate that different forms of the enzyme exist at the several stages of development studied. Alterations produced by solubilization procedures suggest a common structural form which undergoes alteration during maturation.

0168 THE VIABILITY OF PARENCHYMAL LIVER CELLS ISOLATED FROM YOUNG AND OLD RATS. *(E.)*

Van Bezooijen, C. F. A.; Van Noord, M. J.; Knook, D. L. (Inst. Exp. Gerontol., Rijswijk, Netherlands). *Mechanisms Ageing Dev.* 3(2):107-119, 1974.

Isolated parenchymal cells from young and old rats were utilized in *in vitro* studies on cellular aging processes in the rat liver, and the various criteria for the viability of these cells discussed. Under ether anesthesia, the liver and portal vein of female WAG/Rij rats (2 week - 36 month) were dissected free and left *in situ*. A cannula was inserted into the portal vein. After a rapid (25 ml/min) infusion of about 15 ml of dissociation medium (standard medium plus 0.05% collagenase and 0.10% hyaluronidase) the liver blanched and then was perfused *in situ* with 50 ml dissociation medium at 37 C at a rate of 3 ml/min. The liver was excised and the isolated parenchymal cells assayed for viability. Trypan blue exclusion demonstrated the impermeability of the plasma membrane. The ultrastructural integrity of the impermeable cells was confirmed by electron microscopic observations. Oxygen consumption as measured by a Clark oxygen electrode was comparable to that of hepatic parenchymal cells in intact tissue. Succinate or other tricarboxylic acid cycle intermediates did not increase the respiration of isolated cells, but a marked stimulation was observed if cell debris was present. The endogenous respiration/million cells was higher for cells from old rats than for cells from young rats. This increase could be attributed to an increase in average cell size resulting from a shift to polyploid cells with age. The results obtained show that the cells isolated by this method are comparable to intact liver tissue with respect to endogenous respiration, membrane permeability, and ultrastructural appearance.

0169 CITRULLINE SYNTHESIS IN RAT TISSUES AND LIVER CONTENT OF CARBAMOYL PHOSPHATE AND ORNITHINE. *(E.)*

Raijman, L. (Univ. South. California Sch. Med., Los Angeles). *Biochem. J.* 138(2): 225-232, 1974.

The intracellular localization and activity of ornithine carbamoyltransferase were studied in whole liver homogenates and hepatocyte mitochondrial preparations from male Wistar rats. Rat liver ornithine carbamoyltransferase appeared to be located exclusively in the mitochondria. The activity that was found in the soluble fraction was indistinguishable from mitochondrial ornithine carbamoyltransferase by simple kinetic criteria, and seemed to result from breakage of mitochondria during homogenization. Of several rat tissues studied, only the liver and small intestinal mucosa contained significant amounts of ornithine carbamoyltransferase. The activity in intestinal mucosa was less than 1/1000th of that in liver. The distribution coincides qualitatively with that of carbamoyl phosphate synthetase I and its cofactor, acetylglutamate. The rat liver contents of carbamoyl phosphate and ornithine were 0.1 and 0.15 µM/g wet weight, resp. On the basis of these values, it is proposed that the ornithine carbamoyltransferase activity of liver *in vivo* may be much lower than its maximal activity *in vitro* might suggest.

0170 HYDROXYLATION OF TAUROLITHOCHOLATE BY ISOLATED HUMAN LIVER MICROSOMES. II. CYTOCHROME P-450 DEPENDENCY. *(E.)*

Czygan, P.; Greim, H.; Trulzsch, D.; Rudick, J.; Hutterer, F.; Schaffner, F.; Popper, H.; Rosenthal, O.; Cooper, D. Y. (Mt. Sinai Sch. Med., City Univ. New York, N.Y.). *Biochim. Biophys. Acta* 354(2):168-171, 1974.

The dependency of conversion of taurolithocholate to taurohyodeoxycholate by 6α-hyroxylation on cytochrome P-450 was studied in isolated normal human liver microsomal preparations in the presence of NADPH. The reaction rate in the presence of different concentrations of carbon monoxide (CO) showed a dose-dependent inhibition with 50% inhibition occurring at a partition constant of 1.8. Inhibition of 6α-hydroxylation by CO *in vitro* was maximally reversed with exposure to monochromatic light at 450 nm with a smaller reversal in 1 experiment occurring with exposure to light at 419 nm. These findings indicated for the first time that the human liver microsomal 6α-hydroxylating system is cytochrome P-450 dependent.

0171 IMMUNOLOGICAL AND ELECTRON MICROSCOPIC FINDINGS FOLLOWING HEPATIC AUTOANTIBODY FORMATION. *(Ger.)*

Intorp, H. W.; Stohlmann, J.; Gruber, H.; v. Bassewitz, D. B. (Univ. Med. Polyclin., Munster, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:654-657, 1973.

Rabbits were administered 6 to 14 injections of human or rabbit liver tissue preparations at weekly intervals, after which the antisera obtained were investigated by complement binding test, passive hemagglutination test, and double diffusion test in agargel. Tissue samples were also investigated under electron microscopy. Immunization with human liver preparations caused antibody formation against numerous soluble and insoluble hepatic antigens, while liver-specific reactions were not detected with nonabsorbed antisera. Following absorption, the antisera reacted only with human liver preparations; reactions with kidney and spleen preparations were also detected occasionally. The liver-specific antigens of the soluble tissue fraction were also detected in monkeys. Immunization with rabbit liver homogenates resulted in the formation of antibodies against 2 soluble antigens localized in the hepatic and renal mitochondria in rabbits immunized with 4 injections, and in the formation of antibodies against 2 liver-specific antigens in rabbits immunized with 8 or more injections. Liver biopsies taken shortly before the animals were sacrificed revealed broadening of the periportal fields, proliferation of collagen fibers, lymphocyte and plasma cell infiltration, and proliferation of Kupffer's astrocytes containing phagocytized material with paracrystalline substructure. The findings indicate hepatic autoantibody formation following immunization with heterologous and homologous liver tissue, and cellular immune reactions are confined primarily to the bile ducts and liver parenchyma.

0172 EFFECT OF SERA OBTAINED FROM NORMAL AND PARTIALLY HEPATECTOMIZED RATS AND PATIENTS ON THE GROWTH OF CELLS IN TISSUE CULTURE. *(E.)*

Demetriou, A. A.; Seifter, E.; Levenson, S. M. (Albert Einstein Coll. Med., Bronx, N. Y.). *Surgery* 76(5):779-785, 1974.

The effect of posthepatectomy and normal rat or human serum on cultured E_1 cells derived from rat hepatocytes was studied. Hepatectomies (70%), sham hepatectomies, and unilateral nephrectomies were performed in rats, and filtered, dialyzed serum obtained 24 hr later was added to the culture medium. Addition of serum (5 and 10%) from hepatectomized rats caused considerable stimulation of cell growth; this effect was not altered when serum from rats which underwent hepatectomy and unilateral nephrectomy was added to the medium. Serum from normal, sham-hepatectomized or unilaterally nephrectomized rats produced no effect on cell growth. Similarly, serum from normal human beings or from a patient who had undergone a negative laparotomy following trauma produced no effect. In contrast, serum (5 and 10%) from a man 14 days following 75% hepatectomy done because of liver injury stimulated cell growth considerably. Initial attempts to isolate the stimulating factor revealed that the active compound(s) is entirely filterable through cellophane membrane and has molecular weight of less than 12,000. It is concluded that: (1) normal serum does not contain an inhibitor of cell growth; (2) a factor stimulating cell growth *in vitro* is present in the serum of rats and man following partial hepatectomy; and (3) this stimulating factor has a molecular weight of less than 12,000.

0173 HEPATIC VITAMIN B_{12} RELEASE AND TRANSCOBALAMIN II SYNTHESIS IN THE RAT. *(E.)*

Cooksley, W. G. E.; England, J. M.; Louis, L.; Down, M. C.; Tavill, A. S. (Med. Res. Comm. Clin. Res. Cent., Harrow, England). *Clin. Sci. Mol. Med.* 47(6):531-545, 1974.

The release of ^{57}Co-labeled vitamin B_{12} and the synthesis of transcobalamin II by isolated perfused rat liver were studied 10-42 days after i.m. administrations of 3 μCi (approximately 20 ng) of radioactive cyanocobalamin to 3-4-month-old male Sprague-Dawley rats. The rate of release of $[^{57}Co]$ vitamin B_{12} into plasma and bile was linear and constituted approximately 0.9% and 0.3%, resp., of the initial hepatic radioactivity/hr of perfusion. $[^{57}Co]B_{12}$ released into the plasma was bound to transcobalamin II. Saturation of the total transcobalamin II by the addition of 40 ng/ml of cyanocobalamin to homologous rat plasma (incubated at 37 C for 10 min) before perfusion resulted in the appearance of the hepatic $[^{57}Co]B_{12}$ in the free form. These findings were compatible with *in vivo* observations of urinary and biliary excretion rates of $[^{57}Co]B_{12}$. Rats previously injected 3 μCi i.m. of $[^{57}Co]B_{12}$ were injected i.m. with unlabeled cyanocobalamin in doses of 300 pM, 3.0 nM, 30 nM, or 300 nM in 2 divided doses at 2 hr intervals and released between 1.55% to 7.5% of the final hepatic radioactivity as urinary $[^{57}Co]B_{12}$. Pairs of rats injected i.m. with 300 pM, 600 pM, 1.2 nM, 3.0 nM, 30 nM, and 300 nM of cyanocobalamin (each dose containing 0.12 μCi of cobalt-labeled cyanocobalamin) showed a sharp increase in urinary recovery of injected B_{12} for doses between 600 pM and 3.0 nM, with a gradual rise to an 80% recovery in 4 hr at the maximum dose. Biliary excretion of $[^{57}Co]B_{12}$ in 2 rats was linear at a rate of 0.19%/hr and 0.22%/hr of the final hepatic radioactivity. Liver damage produced by hypoxemia was associated with a fall in the rate of $[^{57}Co]B_{12}$ release. Transcobalamin II release occurred at a linear rate of almost 20 times that required for the binding of newly released hepatic vitamin B_{12}. Cycloheximide at a dose sufficient to inhibit release of transcobalamin II (perfusate plasma concentration of 10-18 μM/liter) did not prevent the release of $[^{57}Co]B_{12}$ from the liver into plasma or bile. Alteration of the perfusate composition in terms of the relative amounts of vitamin B_{12} plasma concentrations or unsaturated transcobalamin II concentrations had no effect on the rate of $[^{57}Co]B_{12}$ release into plasma or bile. The fluxes of hepatic vitamin B_{12} and transcobalamin II appear to be very rapid, and the release of vitamin B_{12} by the rat liver appears to be controlled in the short term by factors other than transcobalamin II synthesis and the concentration of vitamin B_{12} or unsaturated transcobalamin in the plasma.

0174 REGULATION OF THE MITOCHONDRIAL OXIDATION-REDUCTION STATE IN INTACT HEPATOCYTES BY CALCIUM IONS. *(E.)*

Otto, D. A.; Ontko, J. A. (Univ. Oklahoma Med. Res. Found., Oklahoma City). *Biochem. Biophys. Res. Commun.* 61(2):693-700, 1974.

The regulatory influence of calcium on mitochondrial NADH:NAD was investigated in intact hepatocytes from male Holtzman rats. Addition of 1.25 mM calcium chloride to incubated liver cells increased the β-hydroxybutyrate:acetoacetate production ratio from 0.32 to 1.72. A half-maximal production ratio increase occurred at a $CaCl_2$ concentration of 100 μM, with a maximum ratio of 2.0 occurring at 1 mM $CaCl_2$ after steady state (20 min) was achieved. Higher calcium levels did not cause reversal. Chloride salts of barium, cadmium, copper, manganese, strontium, zinc, aluminum, cerium, and lanthanum exerted no such effect, indicating the high specificity of the calcium-induced NADH:NAD elevation. One mM $CaCl_2$ increased the β-hydroxybutyrate:acetoacetate ratio in hepatocytes incubated without added substrates (0.02 to 0.07). The ratio was also increased in the presence of: 10 mM fumarate (0.20 to 0.27); 10 mM L-malate (0.19 to 0.34); 10 mM

L-glutamate (0.10 to 0.22); 10 mM α-ketoglutarate (0.19 to 0.30); 20 mM β-hydroxybutyrate (1.51 to 3.73); and 10 mM L-lactate (0.36 to 0.62). Calcium decreased the β-hydroxybutyrate:acetoacetate ratio from 1.07 to 0.80 when cells were incubated with 10 mM succinate. Calcium did not alter the lactate:pyruvate ratio. The calcium-induced NADH:NAD alteration appeared to be mediated by direct interaction of mitochondrial calcium and not *via* primary effects on the NADH:NAD ratio in the cytosol. The calcium-induced NADH:NAD elevation was reversed by the uncoupler 1799. Calcium appeared to interact with 1 or more respiratory carriers of the inner mitochondrial membrane, with the elevation of NADH:NAD ratio possibly due to the restrictive effect of calcium on NADH utilization.

0175 PORTAL VEIN OCCLUSION IN THE RAT: A NEW TECHNIQUE. *(E.)* Demetriou, A. A.; Seifter, E.; Levenson, S. M. (Albert Einstein Coll. Med., Bronx, N.Y.). *J. Surg. Res.* 17(4):253-254, 1974.

A new technique is described for producing gradual total portal vein occlusion in rats. In this one-step procedure, a dry Ameroid constrictor is placed around the portal vein. As the Ameroid ring swells, the portal vein is slowly occluded. Using this experimental technique, the portal vein was successfully occluded in 20 rats within 7-10 days with no mortalities. None of the rats developed ascites; however, splenic size increased 2-fold. All animals showed extensive inflammatory reaction around the constrictor with development of adhesions.

0176 THE EFFECT OF VASOPRESSIN ON PORTAL HYPERTENSION FOLLOWING HEPATECTOMY. *(E.)* Sirinek, K. R.; Thomford, N. R. (Ohio State Univ. Coll. Med., Columbus). *Surg. Gynecol. Obstet.* 139 (4):573-577, 1974.

In order to study the problem of portal hypertension and splanchnic sequestration which occurs following major hepatic resection, the pharmacologic control of portal hypertension following hepatectomy has been evaluated in dogs. The marked increase in portal vein pressure associated with major hepatic resection was confirmed in control experiments. Administration of vasopressin (0.4 U/ml, 50 ml/hr i.v.) in advance of hepatectomy prevented portal hypertension following hepatectomy but caused a 30% reduction in cardiac output. However, when some vasopressin-treated dogs were given isoproterenol (0.004 mg/ml, 25 ml/hr i.v.) at the time of hepatectomy, the vasopressin-induced reduction in cardiac output was corrected. The addition of isoproterenol did not interfere with the prevention of portal hypertension by vasopressin. Results of these studies suggest that the administration of vasopressin alone or in combination with isoproterenol to selected patients undergoing major hepatic resection may prevent the life-threatening sequestration of blood in the splanchnic vascular bed.

0177 USE OF SELECTIVE, INTRAHEPATIC, PORTAL VENOGRAPHY AND IN VIVO COLORATION IN PLANNING SEGMENTAL HEPATIC RESECTION. *(E.)* Gross, G.; Goldberg, H. I.; Schrock, T. R. (Univ. California Sch. Med., San Francisco). *Am. J. Roentgenol. Radium Ther. Nucl. Med.* 122(2):327-332, 1974.

Selective intrahepatic portal venography and coloration were performed in 5 dogs and 1 newborn lamb. Toluidine blue was injected into hepatic segments *via* a branch of the portal vein so as to visualize the boundary of the segment. The vascular supply and drainage, as well as surface boundaries, were easily identified by the venogram and coloration, permitting successful segmental resection. Portal venography and instillation of the dye did not result in any histologic changes or change in liver function or portal pressure. The technique of selective intrahepatic portal venography and segmental coloration by way of umbilical vein catheterization may thus be useful in facilitating segmental hepatic resection in humans.

0178 COMPARISON OF THE EFFECTS OF TWO-THIRDS HEPATECTOMY AND BILE DUCT LIGATION ON HEPATIC EXCRETORY FUNCTION. *(E.)* Klaassen, C. D. (Univ. Kansas Med. Cent., Kansas City). *J. Pharmacol. Exp. Ther.* 191(1):25-31, 1974.

The plasma disappearance and biliary excretion of sulfobromophthalein (100 mg/kg i.v.), indocyanine green (10 mg/kg i.v.), procainamide ethobromide (10 mg/kg i.v.), and ouabain (4 mg/kg i.v.) were compared in various groups of control, bile duct-ligated, and 2/3 hepatectomized male Sprague-Dawley rats. Although the hepatectomized rats had livers weighing only 40-45% of the controls, they excreted the 4 drugs into the bile at a rate of 60-65% of controls and produced bile at a rate of 80-90% of controls. Both bile duct-ligated and hepatectomized rats showed decreased rates of disappearance for all 4 drugs from the plasma, with BSP and indocyanine green disappearance being influenced to a greater extent by bile duct ligation and procainamide ethobromide and ouabain being more affected by hepatectomy. Plasma BSP at 30-min for hepatectomized and bile duct-ligated rats were 0.4 and 0.6 mg/ml as compared to 0.2 mg/ml for controls (6-8 rats per group). Plasma indocyanine green levels at 30-min for hepatectomized and bile duct-ligated rats were 20 and 40 μg/ml, resp., as compared to 10 μg/ml for controls (6-8 rats per group). Plasma procainamide ethobromide values at 30-min for hepatectomized and bile duct-ligated rats were about 2.5 and 1.8 μg/ml as compared to a little over 1 μg/ml for controls (9-12 rats per group). Plasma ouabain levels at 30-min for hepatectomized and bile duct-ligated rats were about 1.8 and 2.0 μg/ml as compared to a control value of less than 1 μg/ml (6-9 rats per group). The results suggest that normal plasma disappearance of all 4 drugs is dependent both on hepatic mass and transport from liver to bile. It was suggested that hepatic mass is more important for the clearance of procainamide ethobromide and ouabain and that bile transport is more important for the clearance of BSP and indocyanine green.

0179 BILE SALT METABOLISM AND BILE FORMATION IN THE RAT WITH A PORTACAVAL SHUNT. *(E.)*

Herz, R.; Paumgartner, G.; Preisig, R. (Dep. Clin. Pharmacol., Univ. Bern, Switzerland). *Eur. J. Clin. Invest.* 4(4):223-228, 1974.

Biliary secretion of bile salts and bile flow were studied in male Sprague-Dawley rats with liver atrophy resulting from end-to-side portacaval shunts and in sham-operated controls. Three weeks after shunt operation the liver to body weight ratio was reduced by 41%. Bile flow and bile salt excretion were assessed in 13 shunted and 15 sham-operated animals. Bile was collected for a single 10 min period starting 5 min after cannulation. In 15 shunted and 14 sham-operated rats a single 10 min bile sample was collected; the animals were then sacrificed and the liver and intestine removed. Total bile salt pool was obtained as the sum of total bile salts measured in the small and large intestine, in the liver and in the bile. Cholate pool size was calculated from the total bile salt pool size and the percentage of cholic acid in the bile salt mixture of bile; cholic acid half-life and fractional turnover were determined. Hepatic atrophy was accompanied by reduced bile flow (4.9 and 5.9 µl/min/100 g body weight in shunted and sham-operated animals, resp. Bile salt pool size and bile salt secretion were not significantly altered by portacaval shunt. Shunted animals maintained a normal bile salt pool size by increasing bile salt synthesis/U liver weight. Cholate synthesis, calculated from cholate pool size and ^{14}C-cholate turnover rate, was 3.3 and 1.8 µM/24 hr/g liver in shunted and sham-operated rats, resp. It is concluded that the atrophic liver in the rat with a portacaval shunt is able to maintian normal bile salt secretion rates and that the observed decrease of bile flow results from a diminution of bile-salt-independent bile formation.

0180 SECRETION OF SOME HEAVY METALS IN THE BILE OF THE RAT. *(Cz.)*

Tichy, M.; Cikrt, M. (Inst. Hyg. Epidemiol., Prague, Czechoslovakia). *Pracov. Lek.* 24(5):187-189, 1972.

Aqueous solutions of ^{64}CuCl$_2$, ^{52}MnCl$_2$, ^{203}HgCl$_2$, and ^{210}Pb(NO$_3$)$_2$ were injected i.v. in quantities far below toxic doses into rats with bile fistulas, and the secretion of these heavy metals was measured in the bile. In 24-hr bile samples 31.1% of the administered Cu^{++}, 26.7% of the Mn^{++}, 3.8% of the Hg^{++}, and 6.7% of the Pb^{++} were secreted. Electrophoresis of the bile on polyacrylamide disks showed that distribution of Cu^{++} and Mn^{++} in the various bile fractions was about the same, but their distribution differed from that of Pb^{++} and Hg^{++}. Determination of total Mn by atomic absorption spectroscopy and bound Mn by electron paramagnetic resonance (EPR) spectra demonstrated that the quantity of Mn present in complexes varies greatly and depends upon the way the bile has been stored (temperature, exposure to light) and the pH of the bile. The quantity of free Mn^{++} was increased by acidification, reduction with sodium hydrosulfite, and ashing of the bile. There intensity of the EPR signal was reduced by 25-40% by addition of a MnCl$_2$ solution to normal rat bile, by 70% when MnCl$_2$ was added to acidified rat bile, and by 30-40% when the bile was boiled for a short time. These findings indicate that most of the Mn is present in complexes with low molecular weight compounds. A comparison of stability constants of complexes formed by the 4 heavy metals studied with cystein, glycine, disodium ethylenediaminetetraacetate, and sulfides showed that Mn^{++} formed the least stable complexes, while Hg^{++} formed very stable complexes, especially with compounds containing sulfhydryl groups. It is hypothesized that Mn^{++} is secreted as a cation after diffusing through the wall between the blood stream and the bile ducts or through the hepatocyte. Mn^{++} then forms complexes in the bile. In the hepatocyte heavy metal cations can form complexes with low molecular weight compounds (bile pigments, bile acids) with which they are secreted in the bile.

0181 PRE-TREATMENT INFLUENCES ON SGPT LEVELS AND LIVER DAMAGE AFTER INHALATION OF CCl$_4$. *(E.)*

Magos, L.; Butler, W. H.; White, I. N. H.; Green, A. (Med. Res. Counc. Lab., Carshalton, England). *Life Sci.* 15(9):1631-1637, 1974.

Ten groups of male albino rats (4 or 8 animals/group) were subjected to different schedules of phenobarbitone treatment and/or starvation for the 48-hr period preceding a 4 hr exposure to 1150 ppm CCl$_4$ in a dynamic inhalation chamber. Phenobarbitone sodium was given i.p. 24 hr or 48 hr before exposure in a dose of 80 mg/kg followed by a second dose of 50 mg/kg 6 hr later. In starvation, food was withdrawn either from 48-24, 48-0, or 24-0 hrs before exposure. Some animals were killed after the 48 hr pre-exposure period and liver cytochrome P-450 determined. By these treatments a gradual increase in liver cytochrome P-450 was achieved prior to exposure with a 4-fold difference between the lowest, in rats starved 24 hr before exposure, and the highest, in rats given the first phenobarbitone injection 48 hr before exposure. SGPT activity in control rats was 26.5 and this was not affected by starvation or phenobarbitone treatment or their combination. Rats were killed 20 hr after exposure. Neither SGPT activity nor microscopic liver damage correlated with the pre-exposure values of P-450. It is suggested that factors other than the level of cytochrome P-450 determine SGPT levels and liver damage 20 hr after exposure to CCl$_4$.

0182 BIOCHEMICAL MECHANISM OF HEPATIC NECROSIS INDUCED BY AROMATIC HYDROCARBONS. *(E.)*

Reid, W. D.; Krishna, G.; Gillette, J. R.; Brodie, B. B. (Natl. Heart Lung Inst., Bethesda, Md.). *Pharmacology* 10(4):193-214, 1973.

The biochemical mechanism of aromatic hydrocarbon-induced liver necrosis was studied in male Sprague-Dawley rats and male C57 Black/6 mice which received a single i.p. injection of various concentrations of ^{14}C-labeled bromobenzene or other halogenated hydrocarbons. Animals developed centrilobular hepatic necrosis within 24 hr after administration of bromobenzene (4.85 mM/kg). SKF 525-A or piperonyl butoxide injected concurrently with bromobenzene completely blocked necrosis indicating that the hydrocarbon must be metabolized before it can exert its effects. Animals pretreated with phenobarbital (80 mg/kg i.p. daily x 3) to induce hepatic microsomal cytocyrome P-450 enzymes showed increased susceptibility to the damaging effects of bromobenzene (1.45 mM/kg) and other halogenated hydrocarbons. The hepatic necrosis was preceded by covalent binding of substantial amounts of ^{14}C-bromobenzene to liver proteins. Autoradiographs of livers from animals previously injected with ^{14}C-bromobenzene showed that most of the covalently bound material was localized within the necrotic centrilobular hepatocytes strongly suggesting a causal relationship. The livers of mice pretreated with diethyl maleate to deplete hepatic glutathione stores were more sensitive to the destructive effects of bromobenzene than were controls. These results imply that covalent binding of toxic metabolites may be an important mechanism in the pathogenesis of tissue lesions induced by many substances.

0183 THE METABOLISM OF (-)-OCTANOYLCARNITINE IN PERFUSED LIVERS FROM FED AND FASTED RATS: EVIDENCE FOR A POSSIBLE REGULATORY ROLE OF CARNITINE ACYLTRANSFERASE IN THE CONTROL OF KETOGENESIS. *(E.)* McGarry, D.; Foster, D. W. (Univ. Texas Southwestern Med. Sch., Dallas). *J. Biol. Chem.* 249(24):7984-7990, 1974.

The role of hepatic carnitine acyltransferase in the regulation of ketone body formation was studied in isolated perfused livers from male Sprague-Dawley rats which were starved for 24 hr. In agreement with previous findings, perfused livers from the fasted rats converted oleic acid into ketone bodies about 10 times faster than did perfused livers from fed controls; differences in the rates of ketogenesis from octanoate were, however, less pronounced (<2-fold). The relative rates of ketone body production from (-)-octanoylcarnitine more closely resembled those seen with oleic acid than with octanoate. (+)-Octanoylcarnitine, an inhibitor of carnitine acyltransferase, had no effect on octanoate oxidation but did produce significant and quantitatively similar decreases in the rates of oxidation of both oleic acid and (-)-octanoylcarnitine. The results presented support the postulate that the hepatic carnitine acyltransferase system is under strict dietary and/or hormonal control and that it may constitute a primary site for the regulation of hepatic fatty acid oxidation and ketogenesis.

0184 INVESTIGATION OF THE COMPETITION BETWEEN SOME ORGANIC ACIDS FOR BILIARY EXCRETION. *(E.)* Fischer, E.; Varga, F. (Univ. Med. Sch., Pécs, Hungary). *Arch. Int. Pharmacodyn. Ther.* 209(2):349-357, 1974.

The mutual effect of several organic acids (^{35}S-bromsulphthalein, ^{131}I rose bengal, eosin and amaranth) on their biliary excretion was studied following i.v. injection into male Wistar rats with cannulated bile ducts. Compared to control values, plasma and hepatic bromsulphthalein concentrations were higher when bromsulphthalein excretion was inhibited by rose bengal, eosin or amaranth. Conversely, plasma and hepatic rose bengal, eosin or amaranth concentrations were also higher when their excretion was inhibited by bromsulphthalein. None of the 3 inhibitors altered conjugation of bromsulphthalein and glutathione. These results suggested that competition between the compounds for hepatic excretion should occur at the step of uptake or as a result of the inhibition of the biotransformation of bromsulphthalein. The inhibition of excretion of bromsulphthalein, rose bengal and eosin for one another was competitive whereas that for amaranth was non-competitive. Bromsulphthalein and rose bengal were the most potent inhibitors while amaranth was the weakest. The results support the hypothesis that the biliary organic anion carrier has at least 2 different binding sites or that organic anions may be excreted by more than 1 carrier.

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0264 LIVER GLUTATHIONE AND GLUTATHIONE REDUCTASE RESPONSE OF ENDOTOXIN-TREATED MICE. *(E.)* Brown, P. L.; Jeffries, C. D. (Sch. Med., Wayne State Univ., Detroit, Mich.). *Infect. Immun.* 11(1):8-13, 1975.

0265 EFFECT OF HYPOGLYCEMIC SULFONYLUREAS ON HEPATIC FRUCTOSE METABOLISM IN THE RAT. *(E.)* Schonborn, J.; Poser, W.; Panten, U.; Hasselblatt, A. (Inst. Pharmacol. Toxicol., Univ. Gottingen, Germany). *Horm. Metab. Res.* 6(4):284-289, 1974.

0266 THE MECHANISM OF THE NON-OXIDATIVE SEGMENT OF THE PENTOSE CYCLE IN THE LIVER. *(E.)* Rognstad, R.; Katz, J. (Cedars-Sinai Med. Res. Inst., Los Angeles, Calif.). *Biochem. Biophys. Res. Commun.* 61(2):774-781, 1974.

0267 LIVER STORAGE OF VITAMIN A BY RATS FED CARROTS IN VARIOUS FORMS. *(E.)* Sweeney, J. P.; Marsh, A. C. (Agric. Res. Serv., U.S. Dep. Agric., Beltsville, Md.). *J. Nutr.* 104(9):1115-1120, 1974.

0268 REGULATION OF THE MITOCHONDRIAL OXIDATION-REDUCTION STATE IN INTACT HEPATOCYTES BY CALCIUM IONS. *(E.)* Otto, D. A.; Ontko, J. A. (Oklahoma Med. Res. Found., Oklahoma City). *Biochem. Biophys. Res. Commun.* 61(2):743-749, 1974.

0269 THE RELATION BETWEEN URINARY EXCRETION OF TRYPTOPHAN AND NIACIN METABOLITES AND PYRIDINE NUCLEOTIDES IN THE LIVER IN RATS FED A TRYPTOPHAN-DEFICIENT DIET. *(E.)* Ohguri, S. (Inst. Public Health, Tokyo, Japan). *J. Nutr. Sci. Vitaminol.* 20(4):257-261, 1974.

0270 LIVER MICROSOMAL ELECTRON TRANSPORT SYSTEMS. III. THE INVOLVEMENT OF CYTOCHROME b_5 IN THE NADPH-SUPPORTED CYTOCHROME P-450-DEPENDENT HYDROXYLATION OF CHLOROBENZENE. *(E.)* Lu, A. Y. H.; Levin, W.; Selander, H.; Jerina, D. M. (Dep. Biochem. Drug Metab., Hoffman-La Roche Inc., Nutley, N. J.). *Biochem. Biophys. Res. Commun.* 61(4):1348-1355, 1974.

0271 HEPATOCYTE SUSPENSIONS AS A MODEL FOR DEMONSTRATION OF DRUG HEPATOTOXICITY. *(E.)* Zimmerman, H. J.; Kendler, J.; Libber, S.; Lukacs, L. (VA Hosp., Washington, D. C.). *Biochem. Pharmacol.* 23(15):2187-2189, 1974.

0272 A COMPARISON OF THREE PHENOL METHODS FOR EXTRACTION OF RAT LIVER RNA. *(E.)* Paus, P. N. (Dep. Microbiol., Univ. Oslo, Norway). *Acta Chem. Scand.* 28(7):797-801, 1974.

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0274 METABOLISM OF LITHOCHOLIC ACID IN MAN. *(E.)* Cowen, A. E.; Korman, M. G.; Hofmann, F. (Mayo Clin., Rochester, Minn.). *Gastroenterology* 67(4):785, 1974.

0275 HYDROXYLATIONS OF BILE ACIDS BY RECONSTITUTED SYSTEMS FROM RAT LIVER MICROSOMES. *(E.)* Bjorkhem, I.; Danielsson, H.; Wikvall, K. (Dep. Chem., Karolinska Inst., Stockholm, Sweden). *J. Biol. Chem.* 249(20):6439-6445, 1974.

0276 IMPAIRED BILIARY LECITHIN-CHOLESTEROL SECRETION: A CONSEQUENCE OF DEFICIENT DIETARY CHOLINE. *(E.)* Robins, S. J. (VA Hosp., Boston, Mass.). *Gastroenterology* 67(4):823, 1974.

0277 COMPARED ACTIONS OF SECRETIN (S), CHOLECYSTOKININ (CK) AND CAERULEIN (C) ON DOG CHOLERESIS. *(E.)* Angelucci, L.; Catalani, A.; Tavoloni, N. (Inst. Pharmacol. Pharmacognosy, Univ. Rome, Italy). *Br. J. Pharmacol.* 52(3):461, 1974.

0278 BILE SALT INDEPENDENT BILE FLOW DURING RELEASE AND DRAINAGE OF COMMON BILE DUCT IN CHOLECYSTECTOMIZED DOGS. *(E.)* Morris, T. Q.; Baker, K. J.; Bradley, S. E. (Coll. Physicians Surg., Columbia Univ., New York, N. Y.). *Gastroenterology* 67(4): 817, 1974.

0279 EFFECT OF CHOLECYSTECTOMY AND SPHINCTEROTOMY ON BILE ACID WASHOUT IN THE DOG. *(E.)* von Bergmann, K.; Schultheiss, H. R.; Paumgartner, G.; Preisig, R. (Dep. Clin. Pharmacol., Univ. Bern, Switzerland). *Gastroenterology* 67(4):833, 1974.

0280 ACTION OF THE CHRONIC IRRITATION OF THE SECTION OF THE VAGO-SYMPATHETIC NERVES UPON THE CHOLEDOCHAL SPHINCTER IN THE DOGS. *(E.)* Sarles, J. C.; Devaux, M. A.; N'Guyen, R.; Michel, G. (Res. Unit Dig. Pathol., INSERM, Marseille, France). *Eur. Surg. Res.* 6(Suppl. 1):55-56, 1974.

0281 ACRYLAMIDE GEL ELECTROPHORESIS OF LIVER PROTEIN DURING EXTRAHEPATIC CHOLESTASIS IN THE RAT. *(E.)* Lundborg, H.; Blomstrand, C.; Hamberger, A. (Sahlgrenska Hosp., Univ. Goteborg, Sweden). *Eur. Surg. Res.* 6(3):168-175, 1974.

0282 THE EFFECT OF PHENOBARBITAL ON BILE ACID KINETICS IN MAN. *(E.)* Schiff, E. R.; Parker, I. T.; Dick, R. D. (VA Hosp., Miami, Fla.). *Gastroenterology* 67(4):828, 1974.

0283 MICROBIAL BILE ACID TRANSFORMATION. *(E.)* Midtvedt, T. (Rikshosp., Univ. Oslo, Norway). *Am. J. Clin. Nutr.* 27(11):1341-1347, 1974.

0284 TRANSIENT BILIARY LIQUID CRYSTALS AND METASTABLE SUPERSATURATION IN PRAIRIE DOGS DURING RAPID DIETARY INDUCTION OF CHOLESTEROL GALLSTONES. *(E.)* Holzbach, R. T.; Corbusier, C.; Marsh, M. (Cleveland Clin. Found., Ohio). *Gastroenterology* 67(4):799, 1974.

0285 CHANGES IN HEPATOBILIARY PERMEABILITY DURING SODIUM TAUROCHOLATE (Na-TC) LOADING IN NORMAL RATS (N) AND IN RATS TREATED WITH ETHINYL ESTRADIOL (EE). *(E.)* Herz, R. G.; Bradley, S. E. (Coll. Physicians Surg., Columbia Univ., New York, N.Y.). *Gastroenterology* 67(4):797, 1974.

See also, 0023, 0026, 0300, 0302, 0307, 0590, 0591.

SECRETION AND METABOLISM

Intestine

0286 THE PERICRYPTAL FIBROBLAST SHEATH. IV. REPLICATION, MIGRATION, AND DIFFERENTIATION OF THE SUBEPITHELIAL FIBROBLASTS OF THE CRYPT AND VILLUS OF THE RABBIT JEJUNUM. *(E.)* Parker, F. G.; Barnes, E. N.; Kaye, G. I. (Coll. Physicians Surg., Columbia Univ., New York, N.Y.). *Gastroenterology* 67(4):607-621, 1974.

Epithelial-mesenchymal relations were examined in light microscopic studies of human and rabbit small intestine and in electron microscopic and autoradiographic studies of the pericryptal (subepithelial) sheath in the rabbit jejunum. Under the light microscope human and rabbit jejunum displayed the same arrangement of subepithelial fibroblasts with small collagen fibers encircling the crypts and villi. For autoradiographic studies, each of 22 adult American Dutch rabbits received a total of 5 mCi ^{3}H-thymidine as 5 i.v. injections spaced 30 min apart; a pair of rabbits were sacrificed at selected intervals over 21 days. Initial uptake of ^{3}H-thymidine by epithelial cells and fibroblasts was confined to the crypt, and both jejunal populations replicated and migrated through the crypt-villus in approximate synchrony. The initial labeling ratio of epithelial cells to subepithelial fibroblasts was 5 times as large as that reported for the rabbit colon. Electron microscopy showed that fibroblasts of the jejunal sheath were fewer, larger, and more widely spaced than those in the colon. Moreover, the well-developed collagen table seen in the colon was not present in the jejunum. In this respect, the relations among epithelium, fibroblast, and venous capillaries resembles more closely those in the gallbladder than in the colon. Differences in the colonic pericryptal fibroblast sheath and the jejunal subepithelial fibroblast sheath may be related to differences in their absorptive functions. This study demonstrates the importance of interacting epithelial-mesenchymal systems in tissues of adult animals. Additional investigations are necessary to understand the basis and regulation of these interactions in normal and neoplastic tissue.

0287 THE GUT-ASSOCIATED LYMPHOID SYSTEM: NATURE AND PROPERTIES OF THE LARGE DIVIDING CELLS. *(E.)* Guy-Grand, D.; Griscelli, C.; Vassalli, P. (Necker Child. Hosp., Paris, France). *Eur. J. Immunol.* 4(6):435-443, 1974.

The lymphoid cells and ^{3}H-thymidine labeled cells of the Peyer's patches, mesenteric lymph nodes and thoracic duct lymph of Balb/c mice and rats were studied by combined immunofluorescence and autoradiography, using antisera directed against T (mouse-specific lymphocyte antigen) or B (mouse-specific bone marrow-derived lymphocyte antigen) cell antigenic determinants, or against various immunoglobulin (Ig) chains. In some experiments, mice were immunized by 3 weekly injections in the footpads with ferritin (0.5 mg); the mice were killed 4 days after the last injection. Other mice were immunized by injection of 15 x 10^6 sheep RBC in each footpad on the 5th, 4th, and 3rd day before sacrifice. Rats were immunized with killed *Bacillus pertussis*. The migration pattern of these various cell populations after transfer to syngeneic mice or rats was determined by radioactivity counting and autoradiography. Labeled cells from mesenteric lymph nodes and thoracic duct lymph had, in contrast to labeled cells from the peripheral lymph nodes, a marked tendency to localize in the gut, and they migrated in a graft of fetal intestine as well as in the recipient's own gut. This indicates that this selective accumulation is not the result of a mechanism recognizing antigen absorbed from the gut lumen. B-specific labeled cells localizing in the gut contained surface IgA and intracellular IgA, which transform into IgA plasma cells in the lamina propria. It is suggested that the progenitors of the intestinal IgA plasma cells are proliferating surface IgA cells from the germinal centers of labeled Peyer's patches cells. These IgA cells must migrate *via* lymphatics to mesenteric lymph nodes and thoracic duct lymph and mature during this migration, acquiring intracellular IgA chains as well as a gut-localizing mechanism which might be related to this increased IgA synthesis. T-specific labeled cells localizing in the gut migrated both in the lamina propria and in the intestinal epithelium. Most, if not all, of the intraepithelial lymphocytes of the gut mucosa appear to be T lymphocytes derived from rapidly dividing cells. Two types of T-specific labeled cells may exist in the lymphoid system: one that is circulating and localizes in the gut, and a second that does not localize in the gut and may be sessile.

0288 BEHAVIOR OF BILIARY PHOSPHOLIPIDS IN INTESTINAL LUMEN DURING FAT DIGESTION IN RAT. *(E.)* Nalbone, G.; Lairon, D.; LaFont, H.; Domingo, N.; Hauton, J.; Sarda, L. (Res. Group Lipid Transp. U 130, INSERM, Marseille, France). *Lipids* 9(10): 765-770, 1974.

The behavior of biliary phospholipids in the small intestinal lumen of male Wistar rats was studied at different stages of lipolysis to investigate their possible role in phenomena connected with intestinal absorption of triglycerides. Separation of the lipid constituents from total intraluminal contents of 4 rats receiving 800 mg triolein (stomach intubation) showed that at the beginning of lipolysis (1 hr after ingestion) all lecithins, cholesterol, and bile salts were eluted within the 1st column volume in highly opalescent fractions containing triglycerides, diglycerides, and small amounts of free fatty acids and monoglycerides. Intraluminal content analysis (4 rats) at an intermediate lipolysis stage (75 min postingestion) showed 75% of the biliary phospholipids and cholesterol being eluted with the 1st column volume along with triglycerides, diglycerides, lipase, and colipase. These fractions contained 33% of the free fatty acids, 14% of the monoglycerides, and 26% of the bile salts eluted from the column. Intraluminal analysis (4 rats) at the end of lipolysis (90 min after ingestion of 300 mg triolein) resulted in 10% lecithin, 2% monoglyceride, 14% fatty acid, and 6% bile salt elutions along with small amounts of triglycerides and diglycerides in the 1st column volume. The major part of the bile lecithins, cholesterol, bile salts, and lipolysis products was eluted in the 2nd volume (clear fractions). *In vitro* chromatographic studies of reconstituted intraluminal contents confirmed these separation patterns. The experiments demonstrate that biliary lecithins are associated to fatty acids, monoglycerides, and bile salts in the aqueous phase.

0289 INFLUENCE OF PERIODICITY OF EATING ON INTESTINAL GLYCOLYTIC ENZYMES IN THE RAT. *(E.)* Romsos, D. R.; Leveille, G. A. (Dep. Food Sci. Human Nutr., Michigan State Univ., East Lansing). *Comp. Biochem. Physiol.* [A] 49(3):533-540, 1974.

The effects of meal-eating patterns of intestinal hexokinase and pyruvate kinase activities, intestinal mucosal weight, and on diurnal fluctuations of plasma free fatty acids and insulin levels were studied in 60 male Sprague-Dawley rats. Half the animals were fed *ad lib* ("nibbler"), a diet consisting of 58, 30 and 12% carbohydrate, protein and fat, resp., while the other 30 rats were fed for 2 hr in the morning only ("meal eaters") for 5 weeks. Nibblers weighed about 25-40% more ($P<0.05$) and ate significantly more (158 gm/week *vs* 143 gm/week) than the meal eaters, indicating that meal eaters are more efficient than nibblers in converting food to body weight gain. Mucosal weight was greater in the upper small intestine than in the lower segment in both nibblers and meal eaters ($P<0.05$). Hexokinase activity was higher in meal eaters than in nibblers whereas pyruvate kinase activity was about the same. Within intestinal segments, however, pyruvate kinase activity was higher in the upper segment of both groups; hexokinase activity was higher in the lower segment. Total upper intestinal hexokinase activity was significantly greater in meal-fed rats at 4 pm and 9 pm while lower intestinal hexokinase activity was greater in meal eaters only at 4 pm. Hexokinase specific activities, however, were the same at all times. Pyruvate kinase activity was significantly greater in meal eaters only in the upper segment at 4 pm. Plasma free fatty acid and insulin levels showed variations related to meal intake patterns in both nibblers and meal eaters. The results do not support the existence of a time-conditioned response for hexokinase in rats.

0290 DIPEPTIDASE ACTIVITY IN THE SMALL INTESTINAL MUCOSA DURING PREGNANCY AND LACTATION IN THE RAT. *(E.)* Rolls, B. A. (Natl. Inst. Res. Dairy., Shinfield, England). *Br. J. Nutr.* 33(1):1-9, 1975.

Hooded Norwegian rats were mated and at weekly intervals during pregnancy and lactation and after weaning, the dipeptidase activity was determined in supernatant fractions of small intestinal mucosal homogenates for 2 dipeptides: glycyl-L-leucine dipeptidase and L-alanyl-L-glutamic acid dipeptidase. The mucosal supernatant contained 87.1% and 96.1% of the total mucosal glycyl-L-leucine and L-alanyl-L-glutamic acid dipeptidase activities, resp. Slight to moderate increases in total supernatant dipeptidase activities occurred during pregnancy with increases to over 200% of baseline values during the 2nd week of lactation. A similar pattern was observed for dipeptidase specific activity suggesting that the increases in enzyme activity were real and not merely a result of mucosal hyperplasia. Six females which failed to feed their offspring did not show changes in dipeptidase activities. The increases in dipeptidase activities were correlated more closely to increases in mucosal nitrogen content than to increased food intake during pregnancy and lactation and could have been due to hormonal stimulation.

0291 THE ROLE OF VASCULAR AND LYMPH CAPILLARIES IN THE CLEARANCE OF INTERSTITIALLY INJECTED ALBUMIN IN ACUTE AND CHRONIC INFLAMMATION OF THE COLON. *(E.)* Sheppard, M. S.; Sterns, E. E. (Dep. Surg., Queen's Univ., Kingston, Canada). *Surg. Gynecol. Obstet.* 139(5):707-711, 1974.

The role of the vascular and lymphatic capillaries in the clearance of interstitially-injected albumin from the colon during the acute stage of sterile inflammation and in 8 weeks of recovery was investigated in 8 normal mongrel dogs. Within the first 5 hr, 20% of radioiodinated albumin injected (1 ml with an activity ranging from 50-500 μCi/ml) into the interstitial space of the colon was returned to the circulation by the thoracic duct. During the same period, 2% of albumin was transported directly by the blood. Acute sterile inflammation was induced by subserosal injection of sterile talc in saline. Dogs were studied at 4, 7, 21, and 56 days after talc injection. Both lymph flow and the amount of interstitially injected albumin increased by approximately 50% during 5 hr. There was direct access to the blood by slightly over 4% of the interstitially injected dosage, and most of this occurred immediately after injection. Further vascular accumulation was slight and in the same order as in the control group. The changes with respect to albumin transport were most obvious 7 days after the onset of inflammation and subsided rapidly, so that function returned to near normal levels within 3 weeks.

0292 INTESTINAL METABOLISM OF LIPIDS AND LIPOPROTEINS. *(E.)* Gangl, A.; Ockner, R. K. (Univ. California Sch. Med., San Francisco). *Gastroenterology* 68(1):167-186, 1975.

0293 THE MECHANISM OF THE HUMAN INTESTINAL SUCRASE ACTION. *(E.)* Zagalak, B.; Curtius, H. C. (Inst. Pediatr., Univ. Zurich, Switzerland). *Biochem. Biophys. Res. Commun.* 62(3):503-509, 1975.

0294 THE ORIGIN OF ANTIBODY IN INTESTINAL SECRETION OF SHEEP. *(E.)* Husband, A. J.; Lascelles, A. K. (Dairy Res. Unit, Univ. Farms, Camden, Australia). *Aust. J. Exp. Biol. Med. Sci.* 52(5):791-799, 1974.

0295 POSSIBLE ANTIMICROBIAL FUNCTION OF THE LARGE MOLECULAR SIZE VITAMIN B_{12}-BINDING PROTEIN. *(E.)* Gullberg, R. (Karolinska Hosp., Stockholm, Sweden). *Scand. J. Gastroenterol.* [*Suppl.*] 9(29):19-21, 1974.

0296 ARE ENTERIC ENDOTOXINS ABLE TO ESCAPE FROM THE INTESTINE? *(E.)* Gans, H.; Matsumoto, K. (New York Hosp.-Cornell Med. Coll., N.Y.). *Proc. Soc. Exp. Biol. Med.* 147(3):736-739, 1974.

0297 INTRACELLULAR CHLORIDE ACTIVITIES IN THE MUCOSAL EPITHELIUM OF RABBIT TERMINAL ILEUM. *(E.)* Henriques de Jesus, C.; Ellory, J. C.; Smith, M. W. (Inst. Anim. Physiol., Cambridge, England). *J. Physiol. (Lond.)* 244(1):31P-32P, 1975.

0298 RESISTANCE OF ENDOGENOUS INTRALUMINAL PHOSPHOLIPIDS TO PANCREATIC HYDROLYSIS IN THE INTACT RAT. *(Fr.)* Olsson, O.; Boucrot, P. (U.E.R. Nutr., Dijon, France). *Arch. Int. Physiol. Biochim.* 82(4):679-699, 1974.

0299 THE SITES OF INHIBITION OF α-METHYLGLUCOSIDE TRANSFER IN HAMSTER INTESTINE BY L-PROLINE AND GALACTOSE. *(E.)* Browne, J. L.; Smyth, D. H. (Middlewood Hosp., Sheffield, England). *J. Physiol. (Lond.)* 244(1):29P-30P, 1975.

0300 PROPANOLOL INHIBITS BILE ACID STIMULATION OF ADENYLATE CYCLASE IN COLONIC MUCOSA. *(E.)* Coyne, M. J.; Bonorris, G. G.; Chung, A.; Goldstein, L. I.; Schoenfield, L. J. (Cedars-Sinai Med. Cent., Los Angeles, Calif.). *Gastroenterology* 67(4):786, 1974.

0301 KINETIC STUDY OF ELECTROSTATIC INTERACTIONS BETWEEN INTESTINAL ALKALINE PHOSPHATASE AND ITS SUBSTRATE IN CALVES. *(Fr.)* Julien, M.; Ouellet, L. (Dep. Chem., Laval Univ., Quebec, Canada). *Can. J. Chem.* 52(17):3087-3097, 1974.

0302 SOURCES OF CHOLESTEROL IN THE INTESTINAL LYMPH IN RATS FED A CHOLESTEROL-FREE DIET. *(E.)* Ho, K. J.; Taylor, C. B. (Univ. Birmingham, Med. Cent., Alabama). *Proc. Soc. Exp. Biol. Med.* 147(3):826-829, 1974.

0303 TOPOLOGICAL STUDIES ON THE HYDROLASES BOUND TO THE INTESTINAL BRUSH BORDER MEMBRANE. 1. SOLUBILIZATION BY PAPAIN AND TRITON X-100. *(E.)* Louvard, D.; Maroux, S.; Vannier, C.; Desnuelle, P. (Cent. Biochem. Mol. Biol., Marseilles, France). *Biochim. Biophys. Acta* 375(2):236-248, 1975.

0304 ILEAL EPITHELIAL CELL MIGRATION IN ACUTE RENAL FAILURE. AUTORADIOGRAPHIC STUDIES IN THE MOUSE. *(E.)* McDermott, F. T.; Dalton, M. K.; Galbraith, A. J. (Alfred Hosp., Monash Univ., Melbourne, Australia). *Am. J. Dig. Dis.* 19(12):1116-1119, 1974.

0305 CELL RENEWAL IN EXPERIMENTALLY OBSTRUCTED SMALL INTESTINE IN RAT. *(E.)* Kamei, H.; Watanabe, T.; Takemitsu, T.; Momoi, T.; Sugimoto, K.; Kondo, T. (Nagoya Univ. Sch. Med., Japan). *Jpn. J. Surg.* 3(4):237-247, 1973.

0306 CECAL FISTULA FORMATION AND CECECTOMY IN THE RABBIT. *(It.)* Angelini, A.; Cioffi, L. A.; Proto, V. (Inst. Hum. Physiol. I., Univ. Naples, Italy). *Boll. Soc. Ital. Biol. Sper.* 49(23):1390-1396, 1973.

See also, 0012, 0027, 0032, 0507.

GENERAL

0307 CHYLOUS ASCITES CAUSED BY LYMPHATIC AND PORTAL STENOSIS: EXPERIMENTAL STUDY IN THE RAT. *(Fr.)* Leymarios, J.; Roze, C.; Souchard, M.; Debray, C. (Bichat Hosp., Paris, France). *Biol. Gastroenterol. (Paris)* 7(1):53-59, 1974.

Chylous ascites was produced in nearly 100% of 80 male Wistar rats by ligation of 2 intestinal lymph trunks and subtotal stenosis of the portal vein produced by ligation with a metal rod 7 mm in diameter followed by removal of the rod. All rats were fed regular diets until sacrificed in groups of ten at intervals up to 10 days after operation. From day 2 to 7, 1-20 ml of light red chylous ascitic fluid was obtained from nearly every rat; the fluid contained lipid and triglyceride levels of the same order of magnitude or greater than serum levels (measured from aortic blood in 10 control rats) but significantly less than intestinal lymph levels (measured in a 24-hr collection of intestinal lymph from 7 control rats). On day 10 less than 3 ml/animal was obtained from 5 of the 10 rats and none from the others. Two other operations, isolated ligation of 2 lymph trunks (50 rats) and isolated partial stenosis of the portal vein (50 rats), were ineffective in producing chylous ascites. In the former group, there was no peritoneal fluid at all except in 2 rats with 2 ml of fluid of very high lipid and triglyceride content, apparently leaked from intestinal lymph. In the latter group, only about 20% sacrificed on days 1, 5, and 7 had any ascites; 80% killed on day 3 had clear ascites with very low lipid and triglyceride content and less than 4 ml in volume. The success of the combined operation is attributed at least in part to the effect of portal hypertension in preventing the escape of lymph through lympho-venous connections following ligation of lymph trunks.

0308 EFFECTS OF A HIGH-BEEF DIET ON BOWEL FLORA: A PRELIMINARY REPORT. *(E.)* Maier, B. R.; Flynn, M. A.; Burton, G. C.; Tsutakawa, R. K.; Hentges, D. J. (Univ. Missouri Sch. Med., Columbia). *Am. J. Clin. Nutr.* 27(12):1470-1474, 1974.

A study was made to determine whether the quantitative and/or qualitative bowel flora of man could be perceived as changing as a function of a controlled, systematic dietary sequence which included a high-beef regimen. Ten healthy male volunteers (aged 21-30 yr) were used. Four diets were compared, each administered for 4 weeks. The first, an initial normal diet, consisted in g/day of: protein, 77.075; fat, 56.78; CHO, 443.86; fiber, 5.78; and ash, 20.02. A meatless diet contained, in g/day: protein, 85.35; fat, 77.36; CHO, 430.71; fiber, 4.86; and ash, 19.71. A high-meat diet was comprised of, in g/day: protein, 178.73; fat, 74.94; CHO, 436.04; fiber, 6.50; and ash, 20.07. The closing normal diet contained, in g/day: protein, 83.32; fat, 64.24; CHO, 446.68; fiber, 5.71; and ash, 20.07. Total anaerobic counts were elevated during the high-meat and final normal diets, but the differences were not statistically significant. *Bacteroides* species decreased from a value of 2 x 10^{10} to 7 x 10^{9} organisms/g dry weight during the meatless diet regimen. Both the high-meat and the final normal diets caused *Bacteroides* to be elevated to almost 10^{11} organisms/g. *Fuscobacteria* increased during meatless and high-meat diets. *Propionibacteria, Eubacteria,* and *Bifidobacteria* were stable throughout. *Clostridia* was depressed by the high-meat diet. Data indicate that *Bacteroides* and *Bifidobacteria* have an inverse population relation. These analyses indicated that the genus *Bacteroides* may be statistically elevated under high-meat diets, while the average coliform population was elevated during the meatless diet and yet did not drop under the effect of a high-meat regimen.

0309 ADRENERGIC MECHANISMS IN THE CANINE GASTRIC CIRCULATION. *(E.)* Zinner, M. J.; Kerr, J. C.; Reynolds, D. G. (Walter Reed Army Inst. Res., Washington, D. C.). *Physiologist* 17(3):366, 1974.

0310 DRUG-INDUCED CHANGES IN CAPILLARY FILTRATION COEFFICIENT AND BLOOD FLOW IN THE INNERVATED SMALL INTESTINE OF THE ANAESTHETIZED CAT. *(E.)* Richardson, P. D. I. (Med. Coll. St. Bartholomew's Hosp., London, England). *Br. J. Pharmacol.* 52(4):481-498, 1974.

0311 AUGMENTATION OF ARTERIAL HEPATIC AND RENAL FLOW BY EXTRACTED AND SYNTHETIC PARATHYROID HORMONE. *(E.)* Charbon, G. A.; Hulstaert, P. F. (Dep. Cardiovasc. Surg., Univ. Utrecht, Netherlands). *Endocrinology* 95(2):621-626, 1974.

0312 SPECIAL PROBLEMS ASSOCIATED WITH THE ISOLATION AND IDENTIFICATION OF INTESTINAL BACTERIA IN FECAL FLORA STUDIES. *(E.)* Moore, W. E. C.; Holdeman, L. V. (Coll. Agric. Life Sci., Virginia Polytech. Inst., Blacksburg). *Am. J. Clin. Nutr.* 27(12):1450-1465), 1974.

0313 SPECIFIC IMMUNE ANTIBACTERIAL MECHANISMS IN THE INTESTINES OF MICE. *(E.)* Rowley, D. (Dep. Microbiol., Univ. Adelaide, Australia). *Am. J. Clin. Nutr.* 27(12):1417-1423, 1974.

0314 METABOLIC INTERACTIONS AMONG INTESTINAL MICROORGANISMS. *(E.)* Wolin, M. J. (Dep. Dairy Sci. Microbiol., Univ. Illinois, Urbana). *Am. J. Clin. Nutr.* 27(11):1320-1328, 1974.

0315 INTERACTIONS BETWEEN MECHANISMS CONTROLLING THE INTESTINAL MICROFLORA. *(E.)* Freter, R. (Dep. Microbiol., Univ. Michigan, Ann Arbor). *Am. J. Clin. Nutr.* 27(12):1409-1416, 1974.

0316 INTESTINAL ANTIBODY SECRETION IN THE YOUNG PIG IN RESPONSE TO ORAL IMMUNIZATION WITH Escherichia coli. *(E.)* Porter, P.; Kenworthy, R.; Noakes, D. E.; Allen, W. D. (Unilever Res., Sharnbrook, England). *Immunology* 27(5):841-854, 1974.

0317 METABOLISM OF DRUGS BY MICROORGANISMS IN THE INTESTINE. *(E.)* Goldman, P.; Peppercorn, M. A.; Goldin, B. R. (Harvard Med. Sch., Boston, Mass.). *Am. J. Clin. Nutr.* 27(11):1348-1355, 1974.

0318 BIOHYDROGENATION OF STEROLS AND FATTY ACIDS BY THE INTESTINAL MICROFLORA. *(E.)* Eyssen, H.; Parmentier, G. (Rega Inst., Univ. Louvain, Belgium). *Am. J. Clin. Nutr.* 27(11):1329-1340, 1974.

0319 SOME ASPECTS OF THE METABOLISM OF CECAL MICROFLORA IN PROTEIN NUTRITION IN THE RABBIT. *(It.)* Coppola, S.; Percuoco, G.; Proto, V. (Inst. Agric. Microbiol., Univ. Naples, Italy). *Boll. Soc. Ital. Biol. Sper.* 49(21):1253-1259, 1973.

0320 QUANTITATIVE VARIATIONS IN THE INTESTINAL MICROFLORA OF RABBITS FOLLOWING LIGATION OF THE PANCREATIC DUCT. *(Fr.)* Catala, J.; Bonnafous, R. (Lab. Physiol. Dig. Nutr., Paul Sabatier Univ., Toulouse, France). *C. R. Acad. Sci.* [*D*] *(Paris)* 278(26):3351-3353, 1974.

0321 STUDY OF A NEW CLASS OF Escherichia coli MUTANTS WHICH ARE RESISTANT TO COLICINS D AND E_3. *(Fr.)* Hamon, Y.; Peron, Y. (Pasteur Inst., Paris, France). *C. R. Acad. Sci.* [*D*] *(Paris)* 279(10):867-870, 1974.

0322 THE EFFECTS OF ENDOTOXEMIA AND BACTEREMIA ON GASTROINTESTINAL DRUG ABSORPTION IN MICE AND RATS. *(E.)* Hurwitz, A.; Furtado, D.; Low, R. R. (Univ. Kansas Med. Cent., Kansas City). *J. Pharmacol. Exp. Ther.* 192(1):236-241, 1975.

0323 DIFFERENCES IN RENAL EXCRETION OF SUBGROUPS OF BILE ACIDS DEPENDING ON THE INTRODUCTION OF POLAR GROUPS. *(E.)* Back, P. (Med. Clin., Univ. Freiburg, Germany). *Digestion* 10(4/5): 322-323, 1974.

0324 DYNAMICS OF THE AMINO ACID METABOLISM IN ANIMALS WITH ONE STOMACH UNDER VARIOUS PERFORMANCE CONDITIONS. *(Ger.)* von Wiesemueller, W. (Dep. Zootech., Univ. Rostock, Germany). *Wissenschaftl. Z. Univ. Rostock, Math. Naturwissenchaftl. Reihe* 22(8):899-929, 1973.

0325 IMMUNOLOGICAL POTENCY AND STABILITY OF NATIVE AND SYNTHETIC SECRETINS. *(E.)* Boden, G.; Dinoso, V. P.; Owen, O. E. (Temple Univ. Health Sci. Cent., Philadelphia, Pa.). *Gastroenterology* 67(6):1119-1125, 1974.

0326 CONTROL OF FOOD INGESTION IN RUMINANTS BY DUODENAL CHEMORECEPTORS, *(Fr.)* Bueno, L.; Ruckebusch, Y. (Natl. Vet. Sch., Toulouse, France). *C. R. Acad. Sci.* [*D*] *(Paris)* 279(5):409-412, 1974.

0327 STUDIES OF ANTIINFLAMMATORY AGENTS. XXV. EFFECTS OF ANTI-INFLAMMATORY AGENTS ON LEUKOCYTE MIGRATION IN CARRAGEENIN-PERITONITIS OF RATS. *(Jpn.)* Nakanishi, M.; Goto, K. (Res. Lab., Yoshitomi Pharm. Ind., Ltd., Fukuoka, Japan). *J. Pharm. Soc. Jpn.* 94(10):1218-1223, 1974.

0328 CELL MEMBRANE PERMEABILITY CHANGE: AN IMPORTANT STEP IN HORMONE ACTION. *(E.)* Petersen, O. H. (Inst. Med. Physiol. C, Univ. Copenhagen, Denmark). *Experientia* 30(10):1105-1107, 1974.

DIAGNOSTIC PROCEDURES

0329 SERUM ALPHA-FETOPROTEIN (AFP) IN BENIGN AND MALIGNANT GASTROINTESTINAL DISEASES: EVALUATION OF AN IMMUNOENZYMATIC ASSAY. *(E.)* Alpert, E. (Harvard Med. Sch., Boston, Mass.). *Clin. Chim. Acta* 58(1):77-83, 1974.

A sensitive and specific quantitative immunoenzymatic assay was developed for α-fetoprotein. α-Fetoprotein levels were over 50 ng/ml in 78% of 79 patients with primary liver carcinoma. Serum concentrations ranged from 50 to 7,000,000 ng/ml with no correlation to any clinical or pathological features. Of 71 who were tested 14 (20%) were HB Ag-positive by hemagglutination inhibition and an additional 20 of 71 (28%) were HB Ab-positive by hemagglutination. Five children (aged 3 months to 4 yr) with hepatoblastoma had serum α-fetoprotein concentrations between 250 ng/ml and 1.3 mg/ml. In 19 patients with metastatic carcinoma of the liver only 2 were positive. Of 54 patients with acute viral hepatitis at the peak of disease, 7 (13%) showed α-fetoprotein levels between 50 and 1000 ng/ml. Of 9 patients with massive hepatic necrosis probably due to viral hepatitis, 4 were positive. In 86 patients with various forms of chronic liver disease, α-fetoprotein was detected in levels between 50 and 1000 ng/ml in 4 of 17 with both HB Ag-positive and HB Ag-negative chronic hepatitis (23.5%). Of 69 patients with chronic non-viral disease including active post-necrotic and Laennec's cirrhosis, and primary biliary cirrhosis, only 1 patient was positive. No α-fetoprotein was detected in patients with hepatic hemangioendothelium, lymphoma limited to the liver and spleen, hepatic hemangioma, extra-hepatic biliary tract malignancies (5 cases), primary malignancies outside the gastrointestinal tract (17), active inflammatory bowel disease (17), non-viral acute hepatitis (24, including patients with alcoholic hepatitis, halothane hepatitis, and thorazine induced hepatitis), and patients in the stage of active liver regeneration following partial hepatectomy (6). It is concluded that α-fetoprotein elevations in nonmalignant liver disease are not due solely to hepatic regeneration but appear related to viral injury. The immunoenzymatic assay used does not require purified antigen or radioisotope equipment and can detect and quantitate clinically significant α-fetoprotein levels greater than 50 ng/ml.

0330 ALIMENTARY TRACT METASTASES FROM MALIGNANT MELANOMA. *(E.)* Beckly, D. E. (United Bristol Hosp., England). *Clin. Radiol.* 25(3):385-389, 1974.

During the period of 1960 to 1972, 3 men (aged 31-88 yr) presented with combinations of malaise, anorexia, weight loss, epigastric discomfort, shortness of breath, vomiting and lethargy. In each case the only obviously diseased site was the alimentary tract, and there was no clinical evidence of more widespread lesions. Chest radiograms were normal. Each patient had a history of malignant melanoma. The small bowel showed intraluminal filling defects in 2 cases with central collections of barium in 1. The other patient showed a large filling defect in the stomach, with a barium collection in a central depression. Diagnosis of metastatic melanoma of the bowel was obtained at autopsy in 2 of these cases, and by biopsy of the lesions in the 3rd. In view of the relatively large differential diagnosis of the single lesion, definite diagnosis is not likely to be forthcoming from barium studies alone. In these cases biopsy will be necessary. However, examination of the small bowel should be performed. If the lesions are multiple and relevant history of a previous malignant melanoma is available, the gastrointestinal lesions may be suspect as metastases. It is then advisable to conduct a carful search for metastases at other sites, including liver and brain scans.

0331 DIAGNOSIS OF BARRET'S ESOPHAGUS WITH RADIOISOTOPES. *(E.)* Gordon, F.; Ramirez-Degollado, J.; Munoz, R.; Cuaren, A.; Landa, L. (Gen. Hosp., Natl. Med. Cent., Mexico City, Mexico). *Am. J. Roentgenol. Radium Ther. Nucl. Med.* 121(4):716-719, 1974.

A diagnostic procedure using radioisotopes, based on selective concentration of Tc^{99m} pertechnetate by the ectopic gastric mucosa found in Barrett's esophagus, was used in a group of 15 patients with no upper gastrointestinal tract disease. A second group of 7 patients suspected of having Barrett's esophagus was studied by the same method. In all cases of suspected Barrett's esophagus, 5 mCi Tc^{99m} pertechnetate was administered endovenously without previous preparation. In all normal cases, the images showed a uniform concentration of the radioisotope by the gastric mucosa, with a clear limitation of the profile of the organ. In all cases of Barrett's esophagus, apart from the normal concentration in the stomach, concentration of the radioisotope was also observed in the distal esophagus, corresponding to the location of the ectopic gastric mucosa. In every case the scintigraphic findings had good correlation with previous roentgenologic and endoscopic findings and the findings noted at surgery. Pertechnetate ion replaces the anions of elements of Group VII, and when introduced into the body, is accumulated by the thyroid, the salivary glands and the gastric mucosa as well as by other organs, but not by the esophagus. The radiation dose absorbed by the patient is minimal with this technique, and permits the use of Tc^{99m} in amounts ample enough to produce a large number of counts of radioactivity, which generally improves the diagnostic efficiency of the method. It was concluded that diagnosis of Barrett's esophagus with Tc^{99m} pertechnetate is a fast, easy, reliable and innocuous method that may be used as a complementary procedure in the study of patients suspected of having this disease.

0332 THE ENDOSCOPIC DIAGNOSIS OF GASTRIC LYMPHOMA. GROSS CHARACTERISTICS AND HISTOLOGY. *(E.)* Nelson, R. S.; Lanza, F. L. (M.D. Anderson Hosp., Houston, Tex.). *Gastrointest. Endosc.* 21(2):66-68, 1974.

Endoscopic evaluation was made of 40 patients with gastric lymphoma by both color photography and histological examination, the latter obtained by guided gastroscopic biopsy and brush cytology. Of the 40 patients, 30 had reticulum cell sarcoma; 7, lymphocytic lymphoma; 1, Hodgkin's disease; and 2 were unclassified. Of the 40, 21 neoplasms were primary in the stomach and 19 had gastric involvement as part of generalized disease. A slight improvement in gross diagnosis was noted over a previous series, but the sole distinctive characteristic was a peculiar "volcano-like" ulcer crater noted in 9 of 30 patients with reticulum cell sarcoma. A correct diagnosis was made by gastroscopy in 13 of 21 in the primary lymphoma group and by radiology in 7 of 21. In generalized lymphoma, gastroscopy was diagnostic in 17 of 19 and radiology in 14 of 19. An incorrect diagnosis of carcinoma in 7 cases each by gastroscopy and radiology was the most conspicuous and consistent error. Benign ulceration was mistaken in 1 case by gastroscopy and 4 by radiology and gastritis was diagnosed in 1 patient each by both methods. Gastroscopic photography was helpful for a retrospective study of specific features of various lesions but did not improve diagnosis in the frequently confusing situation presented by infiltrations which could be diagnosed either as carcinoma or lymphoma. It was a deciding feature in the initial recognition of the volcano-like ulcer noted in reticulum cell sarcoma. Direct biopsy yielded 5 false-negatives, for an accuracy of 87%. Cytology was performed in 20 of the cases in 4 of whom neoplastic cells were obtained on smear (20% accuracy). Cytology should be useful in the occasional case in which biopsy might be negative and cytology positive. The general conclusion is that gastroscopy with vigorous biopsy attempts should be carried out in all cases of suspected gastric lymphoma as a means of early and nonoperative histologic diagnosis.

0333 GASTROGRAFIN IN PERFORATED DUODENAL ULCER AND ACUTE PANCREATITIS.

(E.) Fraser, G. M.; Fraser, I. D. (Leith Hosp., Edinburgh, Scotland). *Clin. Radiol.* 25(3):397-402, 1974.

Gastrografin (50 ml p.o.) was given to all cases of clinically suspected perforated duodenal ulcer over a 4 yr period 5 min before the chest and abdominal films were taken. Gastrografin was similarly given to any case of suspected acute pancreatitis. A total of 51 patients were investigated. Correct diagnoses were obtained in 24 of the 25 cases of perforated duodenal ulcer and in 9 of 10 cases of acute pancreatitis. Of the 25 perforated ulcer cases (21 male and 4 female aged 18-79 yr), radiological findings included 17 cases (68%) showing free gas and 24 (96%) showing either free gas or a leak of gastrografin or both. The one undiagnosed case showed no free gas nor a leak of gastrografin and was found at operation to have a sealed off perforation. The time interval between perforation and x-ray examination is important in determining whether free intraperitoneal gas is seen. All 7 patients in this series who showed no free gas but who had a leak of gastrografin had a relatively short time interval (mean 2 1/2 hr), whereas the mean for the entire series was 8 hr. The 10 acute pancreatitis patients were all males (aged 31-73 yr). Radiological findings in patients with pancreatitis with gastrografin included stretching of the duodenal loop (8 cases), Frostberg's inverted 3 sign (1), upward displacement of the stomach (8), and localized indentation of the gastric antrum (2). This method is viewed as a simple, safe and quick method of substantially improving diagnostic accuracy in cases of perforated duodenal ulcer and in cases of acute pancreatitis.

0334 DIRECT VISION BRUSHING CYTOLOGY IN THE DIAGNOSIS OF COLO-RECTAL MALIGNANCY.

(E.) Bemvenuti, G. A.; Prolla, J. C.; Kirsner, J. B.; Reilly, R. W. (Dep. Med., Univ. Chicago, Ill.). *Acta Cytol. (Baltimore)* 18(6):477-481, 1974.

Direct vision brushing exfoliative cytology was performed in 135 patients using conventional proctoscopy and in 67 patients using colonoscopy. Twenty-three patients had proven colo-rectal malignancy; the remaining 179 had non-malignant disease. Cytology alone identified 19 of the malignancies, an accuracy of 82.5%. Biopsy alone identified 13 malignancies, an accuracy of 68.4%. Using a combination of procedures all patients with malignancies had a correct diagnosis established by at least 1 of the 2 procedures. Thus, this combination of methods yielded no false-negatives in this series. The high detection rate and the complete safety of brushing cytology emphasize its clinical utility, especially in chronic ulcerative colitis. Where biopsy is contraindicated, brushing cytology under direct vision may remain the only selective early sampling method for tissue diagnosis.

0335 ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY IN THE DOG: A MODEL FOR TRAINING AND RESEARCH.

(E.) Falkenstein, D. B.; Abrams, R. M.; Kessler, R. E.; Jones, B.; Johnson, G.; Zimmon, D. S. (Manhattan VA Hosp., New York, N.Y.). *Gastrointest. Endosc.* 21(1):25-26, 1974.

A canine model for training and research in endoscopic retrograde cholangiopancreatography is described. Mongrel dogs (30-40 pounds), receiving only water for 24-36 hr prior to endoscopy, are given i.v. administrations of atropine (0.4 mg/25 pound) and Surital (sodium thiamylal, 7.5 mg/pound) prior to laryngeal intubation. With the dog in the left lateral recumbent position on a fluoroscopy table, a side-viewing Olympus JF-B duodenoscope is introduced into the esophagus through a mouth gag. The canine gastric configuration is similar to that of man and presents familiar problems in endoscope manipulation. Passage of the endoscopic head through the pylorus requires accurate placement with attention paid to the size of the loop created by the endoscope within the atonic stomach. Positioning the endoscope in the canine duodenum requires 80-100 cm of endoscope length, closely simulating adult human working distances. Within 3-5 cm of the pylorus, the first of 2 papillae is found on the posterio-medial duodenal wall, appearing as a 1.5-2.0 mm pancake-like whitish excrescence pointing distinctly caudad. A second small papilla is found on the medial duodenal wall 1-2 cm caudad. With the viewing port of the endoscope positioned close to the papilla, the orifice is cannulated with a catheter prefilled with Hypaque 50% (sodium diatrizoate). There is usually a small pancreatic common channel that bifurcates into the limbs of the canine pancreas, and insertion of the catheter past this bifurcation (more than 3-4 mm) may result in selective filling of 1 pancreatic limb. Fluoroscopy and spot filming allow visualization and documentation of filled duct systems. Duodenal papillae were identified in 7 of 10 animals, and retrograde visualization of the pancreatic or biliary ducts was achieved in 4 dogs. Failures resulted from poor animal preparation, excessive animal size (inability to reach the duodenum in a 60 pound dog), and manipulative fumbling.

0336 NEEDLE ASPIRATION BIOPSY. A SAFE DIAGNOSTIC PROCEDURE FOR LESIONS OF THE PANCREAS.

(E.) Kline, T. S.; Neal, H. S. (Lankenau Hosp., Philadelphia, Pa.). *Am. J. Clin. Pathol.* 63(1):16-19, 1975.

A review of patients who had had a total of 28 thin-needle pancreatic biopsies taken during laparotomy was undertaken. Of the 28 lesions examined, 18 were malignant and 16 of these were diagnosed unequivocally by cytology. The remaining 10 patients whose lesions were diagnosed as benign, are apparently free of pancreatic malignancy, the majority having been followed for as long as 2 yr. In those patients with malignancy, aspiration biopsy commonly revealed easily identifiable tumor cells. These formed small cell clusters composed of 2-5 cells with marked nuclear anisocytosis and eosinophilic macronucleoli. Other abnormalities included rather scant, sometimes vacuolated, cytoplasm, thickened nuclear membranes, and nuclei containing clumps of chromatin. The benign cells usually exfoliated in large sheets, with polarized cells containing uniform, often eccentric, bland nuclei with moderate cytoplasm. Needle aspiration biopsy of the pancreas at laparotomy is a most useful procedure, both because of the difficulty in recognition of malignancy within this organ and because of the complications of biopsies by conventional technics. If necessary, aspirates may be obtained from multiple areas of the pancreas. Diagnostic accuracy appears high. Biopsy through the duodenum is an added safety precaution for, if a fistula should develop, it would drain directly into the duodenum rather than into the peritoneal cavity.

0337 CRITICAL STUDIES OF THE DIAGNOSTIC VALUE OF CHYMOTRYPSIN DETERMINATIONS IN PANCREATIC DISEASE.

(Ger.) Brugmann, E.; Rohde, L.; Towe, J.; Teichmann, W. (Med. Clin., Univ. Rostock, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 33(4/5): 223-225, 1973.

The chymotrypsin levels were determined in feces from different types of patients by the method described by Haverback *et al.* to assess the diagnostic value of chymotrypsin determination in pancreatic diseases. The chymotrypsin levels determined in fecal samples from 64 patients with gastrointestinal involvement, Angina pectoris vasomotorica and other extraabdominal conditions but with intact pancreas ranged from 130 to 5,400 μg/g, with a geometric mean of 1,010 μg/liter. The geometric mean value of the chymotrypsin level was 80 μg/g (10-393 μg/g) in 18 patients with chronic pancreatitis. The chymotrypsin levels were between 5 and 12 μg/g in 5 patients with carcinoma of the pancreas, and consistently below 10 μg/g in 2 patients with the pancreas extirpated. The lower limit of the normal range was calculated to be at 388 μg/g. The high probability of correct diagnosis makes the chymotrypsin determination suitable as a screening test for pancreatic insufficiency.

0338 ARTERIOGRAPHY IN CHRONIC PANCREATITIS.

(Fr.) L'Hermine, C. (Munic. Hosp., Lille, France). *Ann. Chir.* 27(6):651-655, 1973.

In 15 of 183 cases of chronic pancreatitis, the diagnosis was made on the basis of the arteriogram, which revealed a stricture of the splenic vein. This sign seemed to appear earlier, more frequently, and perhaps more consistently than arterial bruit. The arteriogram was extremely useful in assessing lesions and in detecting certain complications. In 89 cases there were venous lesions, most frequently of the splenic vein. Involvement may also be limited to the splenomesenteric venous trunk, in which case it is useful to examine the integrity of the superior mesenteric vein by a study of the mesenteric arteriogram, since it shows venous return. Superior mesenteric arteriography is the only means of seeing if the involvement is chiefly in the superior mesenteric vein. Splenic complications were relatively uncommon (6 cases), but they were clearly shown by arteriography as a segmentary splenic infarct or localized necrosis or, in more severe cases, as intrasplenic hematoma. One intrahepatic pseudocyst caused by a hematoma was also observed, manifested on the arteriogram as a compressed left branch of the hepatic artery with elongated branches. There were 3 cases of complete obstruction of large arterial trunks: 1 of the splenic artery, which was apparently iatrogenic, and 2 of the hepatic artery, which could have been either iatrogenic or caused by the pancreatitis. Stenosis of the mouth of the celiac trunk occurred in 25 cases. Aortography showed them very clearly, but it was not possible to distinguish between those caused by the pancreatitis and those due to other causes.

0339 LIVER SCANNING IN PATIENTS WITH SUSPECTED ABDOMINAL TUMOR.

(E.) Fee, Jr., H. J.; Prokop, E. K.; Cameron, J. L.; Wagner, Jr., H. N. (Johns Hopkins Hosp., Baltimore, Md.). *JAMA* 230 (12):1675-1677, 1974.

A series of 70 patients who were to undergo laparotomy for probable intra-abdominal tumors was evaluated using recent technical advances to determine the accuracy of liver scanning as the sole preoperative screening test for hepatic metastases. Ten-view liver and spleen scans were performed as part of routine presurgical evaluation 10 min after i.v. administration of 3 to 5 mCi of technetium Tc 99m sulfur colloid. Of the 70 liver scans, 59 (84%) correctly showed either the presence or absence of metastatic diseases as confirmed by surgery. However, of the 48 eventually proved free of hepatic metastases at surgery, 6 had abnormal scans, for a 13% incidence of false-positive results. Among the 22 patients proved at surgery to have hepatic metastases, 5 had normal scans, a 23% incidence of false-negative results. It is noted that in 2 of these 5 cases the lesions were less than 1 cm in size. The accuracy of the serum alkaline phosphatase levels was 63% with a 46% incidence of false positive and an 18% incidence of false-negative results. It is noted that, in spite of its inaccuracies, the liver scan is probably the best of all single diagnostic tools available to the clinician. However, the accuracy of liver scanning is too low to use it as the routine screening method to detect liver metastases. Unless it is combined with other diagnostic tests, the results of liver scan can be misleading and thus of dubious value in preoperative evaluations of the patient with possible hepatic metastases.

0340 HALF-CLEARANCE TIME OF ^{198}AU COLLOID AS A DISCRIMINANT OF LIVER ABSCESS AND MALIGNANCY. *(E.)* Bahk, Y. W. (St. Mary's Hosp., Seoul, Korea). *Br. J. Radiol.* 47(564):857-861, 1974.

The ability of the half clearance time of ^{198}Au colloid to discriminate among abscess, hepatoma, and metastatic tumor of the liver was investigated in a statistical study. The clinical material consisted of 84 cases of amebic abscess, 33 of pyogenic abscess, 81 of hepatoma, and 61 of metastatic tumor. The half-clearance time discriminated correctly 47.9% of abscesses and 64.2% of hepatomas when the 2 diseases were presented together. Discrimination was correct in 55.7% of metastatic tumors and 80.2% of hepatomas when these 2 malignant tumors were presented as a homogeneous sample. Discrimination of abscess (25.6%) and metastatic tumors (1.6%) presented jointly was very poor. The results indicate that measurement of half-life time, which is simple to perform and does not incur any substantial increase in cost and time, can be used as an ancillary test to discriminate abscess and malignant tumors of the liver, particularly metastatic tumors and hepatoma. When used with other liver function tests in the light of pertinent clinical information, this test may prove beneficial.

0341 THE USES AND LIMITATIONS OF RADIOISOTOPES IN THE INVESTIGATION OF GASTROINTESTINAL DISEASES. *(E.)* Braunstein, P.; Song, C. S. (New York Univ. Med. Cent., N. Y.). *Am. J. Dig. Dis.* 20(1):53-90, 1975.

0342 BREATH ANALYSIS: GASTROENTEROLOGICAL APPLICATIONS. *(E.)* Hepner, G. W. (Pennsylvania State Univ. Sch. Med., Hershey). *Gastroenterology* 67(6):1250-1256, 1974.

0343 RECENT DEVELOPMENTS IN GASTROINTESTINAL ENDOSCOPY. *(E.)* Raskin, J. B. (Univ. Miami Sch. Med., Fla.). *Postgrad. Med.* 57(1):85-96, 1975.

0344 FIBERENDOSCOPY OF THE GASTROINTESTINAL TRACT. *(Fr.)* Faye, C. (Paris Hosp., France). *Gaz. Hop.* 145(15):665-674, 1973.

0345 ACUTE GASTROINTESTINAL BLEEDING: A ONE-YEAR PROSPECTIVE STUDY. *(Ger.)* Kapp, F.; Baerlocher, C.; Fahrlander, H. (Med. Dep., Univ. Basel, Switzerland). *Schweiz. Med. Wochenschr.* 104(45):1609-1613, 1974.

0346 ENDOSCOPIC DIAGNOSIS OF BLEEDING IN THE ESOPHAGUS, STOMACH, AND DUODENUM. *(Ger.)* Junghanns, K.; Seufert, R. (Surg. Clin., Univ. Heidelberg, Germany). *Langenbecks Arch. Chir.* 337:505-510, 1974.

0347 INTERPRETATIONS OF SOME TESTS OF UPPER ALIMENTARY FUNCTION. *(E.)* Hunt, J. N. (Guy's Hosp. Med. Sch., London, England). *Rend. Gastroenterol.* 6(2):139-147, 1974.

0348 ENDOSCOPIC DIAGNOSIS OF BLEEDING IN THE SMALL AND LARGE INTESTINE AND RECTUM. *(Ger.)* Fruhmorgen, P.; Zeus, J.; Demling, L. (Med. Clin., Univ. Erlangen, Germany). *Langenbecks Arch. Chir.* 337:557-561, 1974.

0349 EARLY, PRESYMPTOMATIC, PREINVASIVE DIAGNOSIS OF GASTRIC CARCINOMA. *(It.)* Zanelotti, G. (no affil.). *Med. Soc.* 23(5):208-211, 1973.

0350 SIGNIFICANCE OF GASTROFIBROSCOPIC EXAMINATION IN PATIENTS AFTER STOMACH RESECTION. *(Sl.)* Beno, I. (Res. Inst. Nutr., Bratislava, Czechoslovakia). *Lek. Obzor* 22(6):287-290, 1973.

0351 DIFFERENTIAL DIAGNOSIS OF THE ENDOSCOPICALLY DYED LESIONS BY GASTROSCOPIC CLOSE-UP APPEARANCES. *(E.)* Suzuki, S.; Groitl, H.; Suzuki, H.; Endo, M.; Takemoto, T.; Nakayama, K. (Tokyo Women's Med. Coll., Japan). *Endoscopy* 6(2):99-104, 1974.

0352 THE EFFECT OF METOCLOPRAMIDE (PRIMPERAN) DURING GASTROSCOPIC OBSERVATION OF THE ANTRUM AND THE PYLORUS. *(E.)* Hradsky, M.; Stockbrugger, R. (Falu Hosp., Falun, Sweden). *Gastrointest. Endosc.* 21(2):55-57, 1974.

0353 B-GLUCURONIDASE IN GASTRIC SECRETIONS. *(E.)* Ayulo, J. A.; Forrest, G. L. (Dep. Med., Univ. California, Irvine). *Am. J. Gastroenterol.* 62(4):337-344, 1974.

0354 DIAGNOSIS OF THE SMALL INTESTINE. *(Ger.)* Eggerth, G. (Dep. Gastroenterol., Vienna, Austria). *Wien. Z. Inn. Med.* 54(7):291-294, 1973.

0355 A NEW POSSIBILITY FOR ROUTINE X-RAY EXAMINATION OF THE SMALL INTESTINE. *(Ger.)* Stallamor, K. (Rudolfstiftung Hosp., Vienna, Austria). *Wien. Z. Inn. Med.* 54(7):299-305, 1973.

0356 A "FALSE-POSITIVE" ABDOMINAL SCAN FOR MECKEL'S DIVERTICULUM. *(E.)* Lentle, B. C.; Scott, G. W. (Dr. W. W. Cross Cancer Inst., Edmonton, Canada). *Br. J. Radiol.* 48(565):59-61, 1975.

0357 COMPARISON OF METHODS TO DIAGNOSE DEFICIENCY OR MALABSORPTION OF VITAMIN B_{12}. *(E.)* Carlmark, B.; Reizenstein, P. (Karolinska Hosp., Stockholm, Sweden). *Scand. J. Gastroenterol.* [*Suppl.*] 9(29):39-42, 1974.

0358 COLONOSCOPY: DEVELOPMENT, TECHNIQUE, INDICATIONS. *(Ger.)* Seyfried, H. (Dep. Gastroenterol., Vienna, Austria). *Wien. Z. Inn. Med.* 54(7):295-298, 1973.

0359 DIASTATIC SEROSAL LACERATIONS: AN UNRECOGNIZED COMPLICATION OF COLONOSCOPY. *(E.)* Livstone, E. M; Cohen, G. M.; Troncale, F. J.; Touloukian, R. J. (Yale Univ. Sch. Med., New Haven, Conn.). *Gastroenterology* 67(6):1245-1247, 1974.

0360 MANOMETRIC STUDIES ON ANORECTAL CONTINENCE IN CHILDHOOD. PART I: METHOD, REFLEX MECHANISMS, CONTINENCE FACTORS. *(Ger.)* Holschneider, A. M.; Metzler, E. M. (Pediatr. Clin., Univ. Munich, Germany). *Bruns Beitr. Klin. Chir.* 221(1): 14-24, 1974.

0361 FUNCTIONAL DIAGNOSIS OF CHRONIC PANCREATIC DISEASES. *(Ger.)* Brunner, H. (Dep. Gastroenterol., Vienna, Austria). *Wien. Z. Inn. Med.* 54(7):287-290, 1973.

0362 SUCCESSFUL MODIFICATIONS FOR PANCREATIC IMAGING. *(E.)* Chandra, S.; Prezio, J. A. (Mercy Hosp., Buffalo, N. Y.). *J. Nucl. Med.* 15(11): 935-937, 1974.

0363 DIAGNOSIS OF EXOCRINE INSUFFICIENCY OF THE PANCREAS. *(Ger.)* Reichmann, J.; Drogies, I. (Altenburg Hosp., Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 33(1):25-30, 1973.

0364 EXPERIENCES WITH A NEW TEST OF EXOCRINE PANCREATIC FUNCTION IN PROTEIN DEFICIENT PATAS MONKEYS. *(E.)* Gyr, K.; Wolf, R. H.; Imondi, A. R.; Felsenfeld, O. (Univ. Med. Clin., Basel, Switzerland). *Schweiz. Med. Wochenschr.* 104(50): 1888-1889, 1974.

0365 THE SELECTIVE ANGIOGRAPHY OF TR. COELIACUS IN DISEASES ORIGINATING FROM THE PANCREAS. *(E.)* Baldzijski, A.; Mincev, M. (I.P. Pavlov Higher Med. Inst., Plovdov, Bulgaria). *Folia Med. (Plovdov)* 15(4):195-201, 1973.

0366 ENDOSCOPIC RETROGRADE CHOLEDOCHOPANCREATOGRAPHY. *(E.)* Leach, R. E.; Riley, J. C.; Davis, Jr., W. D. (Ochsner Clin., New Orleans, La.). *South. Med. J.* 68(1):49-54, 1975.

0367 DIAGNOSTIC VALUE OF ROUTINE LIVER TESTS. *(E.)* Winkel, P.; Ramsoe, K.; Lyngbye, J.; Tygstrup, N. (Rigshosp., Univ. Copenhagen, Denmark). *Clin. Chem.* 21(1):71-75, 1975.

0368 ENZYMATIC EVALUATION OF HEPATOBILIARY DISEASE. *(E.)* Batsakis, J. G.; Sodeman, T. A.; Deegan, M. J. (Univ. Michigan Med. Cent., Ann Arbor). *Lab. Med.* 5(10):33-37, 40-43, 46-49, 1974.

0369 NON-ENZYME HEPATIC FUNCTION TESTS. *(E.)* Hartwell, R. M.; Hew, Jr., A. Y. (Hotel Dieu, New Orleans, La.). *Lab. Med.* 5(10):24-25, 28-30, 32, 1974.

0370 CLINICAL CORRELATION OF HEPATIC FLOW STUDIES. *(E.)* Witek, J. T.; Spencer, R. P. (Yale Univ. Sch. Med., New Haven, Conn.). *J. Nucl. Med.* 16(1):71-72, 1974.

0371 BILE PLEURITIS: ANOTHER COMPLICATION OF PERCUTANEOUS LIVER BIOPSY. *(E.)* Dosik, M. H. (Univ. California Cent. Health Sci., Los Angeles). *Am. J. Dig. Dis.* 20(1):91-93, 1975.

0372 PROSPECTS AND LIMITATION FOR DIAGNOSIS OF WILSON'S DISEASE FROM LIVER BIOPSIES. *(Ger.)* Brandt, G. (Inst. Pathol., Univ. Erlangen, Germany). *Beitr. Pathol.* 152(2):151-162, 1974.

0373 LIVER SCINTIGRAPHY WITH A SCINTILLATION CAMERA. COMPARISON BETWEEN ^{99m}Tc-Sn-COLLOID AND ^{99m}Tc-PHYTATE. *(Jpn.)* Aburano, T.; Ueno, K.; Watanabe, H.; Hisada, K. (Sch. Med., Kanazawa Univ., Japan). *Radioisotopes* 23(7):391-394, 1974.

0374 AN EVALUATION OF ^{99m}Tc-SULFUR COLLOID LIVER SCINTISCANS AND THEIR USEFULNESS IN METASTATIC WORKUP: A REVIEW OF 1,424 STUDIES. *(E.)* Lunia, S.; Parthasarathy, K. L.; Bakshi, S.; Bender, M. A. (Roswell Park Mem. Inst., Buffalo, N. Y.). *J. Nucl. Med.* 16(1):62-65, 1974.

0375 THE VALUE OF COLLOID AND LIVER CELL SCINTIGRAPHY AS WELL AS LAPAROSCOPY AND LIVER SEROLOGY IN THE DIAGNOSIS OF LIVER TUMORS. *(Ger.)* Muller, J. (Inst. Med. Radiol., Univ. Basel, Switzerland). *Schweiz. Med. Wochenschr.* 104(31):1085-1091, 1974.

0376 HEPATOSPLENIC SCINTIGRAPHY FOR LIVER TUMORS IN CHILDREN. *(Fr.)* Piepsz, A.; Struyven, J.; Decostre, P.; Maurus, R. (St. Pierre Hosp., Brussels, Belgium). *Helv. Paediatr. Acta* 29(4):371-382, 1974.

0377 CLINICAL APPROACH TO JAUNDICE. *(E.)* Dusol, Jr., M.; Schiff, E. R. (Univ. Miami Sch. Med., Fla.). *Postgrad. Med.* 57(1):118-128, 1975.

0378 RADIOLOGICAL CHANGES IN LEFT LOBE AMOEBIC LIVER ABSCESSES. *(E.)* Ramachandran, S. (Colombo North Gen. Hosp., Ragama, Sri Lanka). *Postgrad. Med. J.* 50(589):689-693, 1974.

0379 PSEUDOTUMORS IN ACUTE HEPATITIS. *(E.)* Winston, M. A.; Shapiro, M. (VA Wadsworth Hosp. Cent., Los Angeles, Calif.). *J. Nucl. Med.* 15(11):1039-1040, 1974.

0380 TECHNETIUM 99m SULFUR COLLOID SPLEEN/LIVER RATIO AND OTHER LIVER FUNCTION TESTS IN THE DIAGNOSIS OF CIRRHOSIS. *(E.)* Habibian, M. R.; Kutka, N.; Wilkinson, Jr., R. H.; Goodrich, J. K.; Harris, C. C. (Duke Univ. Med. Cent., Durham, N. C.). *South. Med. J.* 68(1):5-12, 1975.

0381 COMBINED COLLOID AND ROSE BENGAL LIVER SCANNING IN A PATIENT WITH CIRRHOSIS AND A FUNCTIONAL HEPATOMA. *(E.)* Gamlen, T. R.; Ackery, D. M.; Grant, R. W.; Jacoby, R. J.; Kenny, R. W.; MacIver, A. G.; Triger, D. R.; (Southampton Univ. Hosp., England). *Br. J. Radiol.* 48(565):61-62, 1975.

0382 COMPARISON BETWEEN THE ^{131}I-ROSE BENGAL RADIOISOTOPIC HEPATOGRAM INDICES AND THOSE OF OTHER LABORATORY EXAMINATIONS IN PATIENTS WITH CIRRHOSIS HEPATIS. *(E.)* Mincev, M.; Zaharieva, Z. (I. P. Pavlov Med. Inst., Plovdiv, Bulgaria). *Folia Med. (Plovdiv)* 16(1):35-41, 1974.

0383 SCINTIGRAPHIC STUDIES OF THE HEPATIC CIRRHOSES. *(E.)* Bozduganov, A.; Maistorski, A.; Janev, P. (I. P. Pavlov Med. Inst., Plovdiv, Bulgaria). *Folia Med. (Plovdiv)* 15(4):187-194, 1973.

0384 THE SCINTIGRAPHIC DEMONSTRATION OF BILE LEAKAGE UTILIZING ^{131}I-ROSE BENGAL. *(E.)* Wiener, S. N.; Vyas, M. (Mt. Sinai Hosp. Cleveland, Ohio). *J. Nucl. Med.* 15(11):1044-1046, 1974.

0385 GALLIUM GALLBLADDER SCANNING IN CHOLECYSTITIS. *(E.)* Waxman, A. D.; Siemsen, J. K. (Univ. South. California Med. Cent., Los Angeles). *J. Nucl. Med.* 16(2):148-150, 1975.

See also, 0177, 0397, 0427, 0502, 0506, 0521, 0527, 0552, 0561, 0562, 0565, 0580, 0595, 0642, 0671, 0683, 0685, 0696, 0697, 0788.

GASTROINTESTINAL DISEASES

ESOPHAGUS

0386 GASTROINTESTINAL MANIFESTATIONS OF STEINERT'S DISEASE. *(Fr.)* Cappoen, J. P.; Lhermine, C.; Proye, C.; Dumont, J. C.; Voiment, Y. M.; Linquette, M. (Munic. Hosp., Lille, France). *Lille Med.* 18(10):1215-1222, 1973.

Observations of gastrointestinal transit are reviewed in 9 patients with myotonia atrophica. Three patients had high dysphagia associated with pharyngeal (1 case) and/or retrosternal (3 cases) blocks. In 2 cases there were more severe problems in swallowing with attacks of coughing during eating; in one case, these problems were the immediate cause of death. Manometric and cineradiographic studies confirmed that problems in swallowing resulted from a reduction of cricopharyngeal sphincter tonus. In all 9 cases there was esophageal paralysis with few or no peristaltic contractions: this was associated with esophageal dilatation. There was no correlation between the extent of esophageal motor disorders and signs of gastrointestinal dysfunction. The involvement of the esophagus is proof of the involvement of smooth muscle in the disease, since the lower 2/3 of the esophagus is essentially made up of smooth muscle fibers. The stomach, gall bladder, small intestine, and colon may also be involved, but such involvement has not often been demonstrated functionally.

0387 MECHANISM OF ACTION OF FUNDOPLICATION. *(E.)* Siewert, E.; Jennewein, H. M.; Waldeck, F. (no affiliation). *Proc. Int. Symp. Gastrointest. Motility, 4th, 1973*, p. 145-150.

Contractility studies were conducted on lower esophageal sphincters and on isolated muscle strips from various areas of the gastric wall of dogs and were compared to results of comparable studies on the reconstructed lower esophageal sphincter of humans following fundoplication. The function of the fundus cuff was investigated in 2 groups of 6 dogs each. In the first group, which had a normal sphincter but underwent fundoplication, the resting pressure of the esophageal sphincter and of the fundus cuff added up to an unphysiologically high pressure (45.5 mm Hg) compared to that of unoperated controls (20.0 mm Hg). The lower esophageal sphincter pressure almost doubled (81.0 mm Hg) following i.v. infusion of pentagastrin (3.0 µg/kg), a response proportionally the same as that of controls (49.3 mm Hg). Glucagon infusion (30 µg/kg) proportionally reduced lower esophageal sphincter tone in both controls (5.3 mm Hg) and fundoplicated animals (11.0 mm Hg), suggesting relaxation of both the fundus cuff and the sphincter. Elimination of the sphincter by circular myomectomy abolished sphincter tone (3.6 mm Hg) as well as the response to pentagastrin (4.0 mm Hg) and glucagon (1.0 mm Hg). Fundoplication following myomectomy restored both resting pressure (13.6) and response to pentagastrin (33.3 mm Hg) and glucagon (10.5) infusion. The results were correlated with sphincter pressures in human patients following fundoplication. Average resting pressure in such patients (17.3 mm Hg) compared favorably to those of unoperated controls without incompetent sphincters. The sensitivity to pentagastrin stimulation was somewhat reduced, with only a 12.7 mm Hg pressure increase It was thus possible to demonstrate pentagastrin stimulation of the fundus cuff in humans. The therapeutic mechanism of fundoplication is therefore characterized by an increase in the sphincter pressure to higher levels which ensure gastroesophageal competence.

0388 PEDUNCULATED TUMOURS OF THE OESOPHAGUS. TWO CASES OF LIPOMA. *(E.)* Liliequist, B.; Wiberg, A. (Dep. Neuroradiol., Umea Univ., Sweden). *Acta Radiol.* [*Diagn.*] *(Stockh.)* 15(4):383-392, 1974.

0389 OUR EXPERIENCE WITH THE COMBINED THERAPY OF ESOPHAGEAL CANCER: TELEGAMMATHERAPY FOLLOWED BY SURGERY. *(Rus.)* Kochegarov, A. A.; Abdurasulov, D. M.; Vorobeva, L. I.; Kasymkhodzhaev, E. S.; Chernyshov, V. K. (Uabek Sci. Res. Inst. Oncol. Radiol., Tashkent, USSR). *Khirurgiia (Mosk.)* (2):86-93, 1974.

0390 SYMPTOMS OF GASTRO-ESOPHAGEAL REFLUX. *(Ger.)* Siegrist, P. W.; Krejs, G. J.; Blum, A. L. (Triemli Munic. Hosp., Zurich, Switzerland). *Dtsch. Med. Wochenschr.* 99(42):2088-2094, 1974.

0391 HEARTBURN AND GASTROESOPHAGEAL REFLUX. *(Ger.)* Krejs, G. J.; Brandli, H. H.; Seefeld, U.; Caro, G.; Blum, A. L. (Triemli Munic. Hosp., Zurich, Switzerland). *Helv. Med. Acta* 37(5/6):405, 1974.

0392 BLEEDING ESOPHAGEAL VARICES. *(Ger.)* Ungeheuer, E. (Nordwest Hosp., Frankfurt/Main-Praunheim, Germany). *Langenbecks Arch. Chir.* 337:519-526, 1974.

0393 SCHATZKI-GARY LOWER ESOPHAGEAL RING IN SCLERODERMA. *(Sp.)* Pajares Garcia, J. M.; Rodriguez Cortes, J.; Martinez Pineiro, M.; Torralba, J. (Gran Hosp. del Estado, Madrid, Spain). *Rev. Esp. Enferm. Apar. Dig.* 44(2):167-174, 1974.

0394 PATHOLOGY OF THE ARTIFICIAL ESOPHAGUS MADE FROM SMALL INTESTINE AS SHOWN BY X-RAYS. *(Rus.)* Rozenfeld, L. G.; Bagirov, M. M. (Kiev Sci. Res. Inst. Otolaryngol., USSR). *Khirurgiia (Mosk.)* (2):93-98, 1974.

See also, 0331, 0405, 0431, 0673, 0718, 0748, 0749.

0395 INCIDENCE OF CARCINOMA OF STOMACH AND TUMOR TYPE.

(E.) Whitehead, R.; Skinner, J. M.; Heenan, P. J. (Radcliffe Infirm., Oxford, England). *Br. J. Cancer* 30(4):370-372, 1974.

Gastrectomy specimens of 101 cases of carcinoma of the stomach recorded between 1940 and 1946 at a specific hospital in England were reviewed. A group of 22 cases of carcinoma of the stomach reported during 1971 and 1973 at the same hospital were also studied. The 2 groups of patients, separated by a period of 25 yr, were compared to determine if any changes in the type of malignancy (intestinal or diffuse), or in the precise location of atrophic gastritis and intestinal metaplasia in relation to the types of cancer could be noted. In both periods of time, the male to female ratio was about 2:1. The age range of the patients of each sex was not significantly different, nor was the population from which the 2 groups were drawn. There is no evidence that the methods of diagnosis or the criteria of selection for surgery have altered during the 25 yr intervening period. The ratios of intestinal to diffuse carcinoma were not significantly different. Atrophic gastritis and intestinal metaplasia had the same incidence in both types of cancer, and the distribtuion of these 2 lesions did not change during the 25 yr period. It is suggested that if the 2 main tumor types have a different etiological background, this is affected equally by whatever has been responsible for the falling rate of carcinoma of the stomach in England. Evidence suggests that environmental rather than racial or hereditary factors are responsible for the differences in the incidence of gastric cancer. However, in low risk areas, non-environmental factors must play a greater role in determining the cancer rate.

0396 HISTOPATHOLOGICAL STUDY ON DOUBLE CANCER OF THE STOMACH WITH SPECIAL REFERENCE TO COMBINATIONS OF HISTOLOGICAL TYPES.

(Jpn.) Baba, Y.; Kakamura, K.; Sugano, H.; Takagi, K.; Nishi, M.; Kamukura, K. (Cancer Inst., Tokyo, Japan). *Gan No Rinsho* 19(1):28-38, 1973.

Out of 2408 cases of carcinoma of the stomach, resected from patients during the past twelve years, 153 cases showed multiple carcinoma. Of these, 110 cases of double carcinoma were studied in relation to combination of histological type, sex, age and cancer size. Classification of histological type was made if two carcinomas in the same stomach were of differentiated (D or d) or undifferentiated type (U or u; the capital letter represents a large carcinoma and the small letter, a small carcinoma). Seventy-five cases of double carcinoma were the combination of Dd; then, 22 cases of Ud, 8 of Uu, and 5 of Du, indicating that the smaller carcinomas tend to be of the undifferentiated type. The frequency of occurrence of multiple carcinoma was 6 times greater in males than in females. The Dd type double carcinoma in male patients was found five times more frequently than that in females; however, the ratio of occurrence of the Uu type of carcinoma by male and female was only 1.6. The average age of double carcinoma patients was 58.8, which was slightly higher than the average age of the 2408 stomach cancer patients, namely, 55.3. There was 10 years' difference between the average ages of patients with Dd and those with Uu type carcinomas. With increased patient age, more intestinal carcinoma was found, and also the differentiated type was found more often in the small carcinoma. With regard to carcinoma size, it was assumed that the size of a carcinoma is linearly related to its age. Small carcinoma developed independently of the size of large carcinoma. Carcinomas of both sizes tend to meet together during growth, under which circumstances the diagnosis of double carcinoma would be impossible. When the large carcinoma is of the differentiated type, the developing small carcinoma also is of the differentiated type, no matter how old the large carcinoma is. However, when the large carcinoma is of the undifferentiated type, the small carcinoma tends to be of the undifferentiated type provided the large carcinoma is a relatively young one, but the small carcinoma tends to be of the differentiated type when the large carcinoma is an old one.

0397 A POPULATION SCREENING FOR FETAL SULFOGLYCOPROTEIN ANTIGEN IN GASTRIC JUICE.

(E.) Hakkinen, I. P. T. (Dep. Pathol., Univ. Turku, Finland). *Cancer Res.* 34(11):3069-3072, 1974.

The results of screening for fetal sulfoglycoprotein antigen in the age group of 40-65 are presented. Of the three populations considered, 2 were composed of industrial personnel and 1 was composed of unselected rural people. A total of about 14,000 people participated. Fetal sulfoglycoprotein antigen was present in the gastric juice in about 3% of the industrial and from 5-7% in the rural population. Three histologically verified cases and 1 suspected case of gastric cancer, all clinically symptomless, were found among the fetal sulfoglycoprotein antigen-positive cases. In addition, there was 1 case of gastric polyposis. All of these cases underwent radical surgery. In addition, benign alterations were found in the examination of 461 fetal sulfoglycoprotein antigen positives. These included benign ulcer in 10 cases, deformation of pylorus in 12, erosion in 8, resection due to earlier ulcer in 15, gastritis in 61, atrophy in 23, and polyps in 15. These alterations, 144 in total, were single or combined in 126 persons. The follow-up since 1970 had shown no new case of clinical gastric cancer appearing among the fetal sulfoglycoprotein antigen-negative persons. The possibility of using this screening method may be significant in early cancer detection.

0398 MUCOSAL GLYCOPROTEINS IN CARCINOMA CELLS OF GASTROINTESTINAL TRACT, AS DETECTED BY IMMUNOFLUORESCENCE TECHNIQUE.

(E.) Kawasaki, H.; Kimoto, E. (Kurume Univ. Sch. Med., Japan). *Acta Pathol. Jpn.* 24(4):481-494, 1974.

Antisera, obtained by immunization of human or porcine gastric mucosa-specific (GMP) and intestinal mucosa-specific glycoprotein (IMP) into rabbits, were employed for the immunofluorescence staining of carcinoma cells in the gastrointestinal tract. In normal mucosa, the fluorescence for GMP was seen in the PAS-alcian blue-stainable mucous cells of gastric glands. The intensity of the fluorescence correlated well with the distribution of PAS stain. The fluorescence for GMP was scarcely demonstrable in any intestinal mucosa cells except Brunne's cells of the duodenum. Fluorescence for IMP was scarcely demonstrable in the gastric mucosa. The alcianophilic goblet cells in the intestinal mucosa were intensely fluorescent with anti-IMP antiserum. Immunohistological studies on carcinoma cells of the gastrointestinal tract showed that the well-differentiated carcinoma cells of adenocarcinoma type, having an orderly arranged glandular pattern, were devoid of fluorescence. The diffusely and dissociated proliferating carcinoma cells fluoresced well for GMP and IMP. Carcinoma cells of less-differentiated and less orderly arranged glandular structures were also fluorescent. In general, the intensity of fluorescence correlated well with the disordering of glandular structure. The distribution of fluorescence of GMP correlated well with the PAS-positive neutral mucus, while that for IMP distributed concordantly with the acid mucus of PAS-alcian blue-positive staining. The gastric mucosal glycoprotein appeared in most cases of rectal carcinomas in association with the intestinal one, indicating that gastric metaplasia occurred in rectal carcinoma in the same way as intestinal metaplasia did in gastric carcinoma. Carcinoma cells metastasizing into serous effusion singly or in small clusters fluoresced well. Malignant cells in effusions, metastasizing from other organs, were not fluorescent. Any cells in effusion of non-cancerous disease, i.e. cirrhosis were scarcely fluorescent. Thus, this immunofluorescence technique is valuable in distinguishing the primary lesion of malignant cells in effusions. If a causal relation exists between the deletion of normal antigens and carcinogenesis, these findings of similar patterns of antigenic modification suggest some common link in the carcinogenic process. Uncontrolled growth could be due to loss of certain cellular constituents that enable normal cells to respond to regulative stimuli.

0399 GEOGRAPHICAL PATHOLOGY OF GASTRIC CARCINOMA.

(E.) Kubo, T. (Fac. Med., Kyushu Univ., Fukuoka, Japan). *Acta Pathol. Jpn.* 24(4):465-479, 1974.

An international comparative study was made of gastric carcinoma in order to determine whether the tumor showed different morphological features in different countries. The series were from Japan, Korea, USA, New Zealand, and Chile. Further comparison was made at different time periods in the USA, New Zealand, and Japan. The majority of tumors were found in the lower 2/3 of the stomach in all countries with no marked international difference. In all countries the predominant type among older patients was the adeno-mucoid type; in younger patients, the diffuse type. Therefore, in countries with a larger number of younger patients, an apparently higher incidence of the diffuse type was noted. After compensating for the difference in patient populations, a slight difference in the number of both types (diffuse and adeno-mucoid) was noted in different countries, but this showed no uniform trend in regard to the different mortality rates in the countries. Within Japan there were differences in mortality rates for various areas of the country. However, the data showed that there was no geographical difference with regard to histological type whether mortality rates were high or low. In a study of data from the USA, where mortality rates due to gastric carcinoma are declining, no change in histological type could be linked with this decline. It was concluded that there is no significant difference in histological appearance of gastric carcinoma either in different countries or at different times. It is suggested that a common factor may be operating throughout the world as a gastric carcinogen.

0400 INDOLENT MUCOID CARCINOMA OF STOMACH.

(E.) Brander, W. L.; Needham, P. R. G.; Morgan, A. D. (Westminster Med. Sch., London, England). *J. Clin. Pathol.* 27(7):536-541, 1974.

Histological sections of 574 cases of carcinoma of the stomach, either biopsied (17 cases) or resected (557 cases) were reviewed. If 50% or more of the bulk of the tumor represented in the sections was epithelial mucus, either intracellular or extracellular, the carcinoma was classified in the mucoid group. Of the 574 carcinomas, 50 (8.7%) were classified as mucoid. Of these, 41 (24 men and 17 women, aged 37-83 yr) were of mixed pattern, 3 (all men, aged 51-80 yr) were of pure signet-ring type, and 6 (all men, aged 45-76 yr) were easily recognizable as the well differentiated type. Treatment in 49 of these cases was by partial or total gastrectomy; 1 of the signet-ring carcinomas was inoperable. Survival of those with mucoid carconoma of mixed pattern was an average of 18 months. Even excluding those in whom distant metastases was noted at the time of operation, this period could only be extended to 21 months. The 3 cases of signet-ring pattern had a mean survival time of 5 months. In contrast, the 6 cases with well differentiated mucoid carcinoma had a mean survival time of 9 yr, even including those with lymph-node involvement. Preoperative history in all cases ranged from 4 months to several years and was not significantly different for any of the 3 types. Thus the accepted view that mucoid carcinoma of the stomach has a poor prognosis may not hold for those patients with the well differentiated type.

0401 NATURAL HISTORY OF AUTOIMMUNE ACHLORHYDRIC ATROPHIC GASTRITIS. A 1-15 YEAR FOLLOW-UP STUDY.

(E.) Irvine, W. J.; Cullen, D. R.; Mawhinney H. (R. Infirm., Edinburgh, Scotland). *Lancet* (7819):482-485, 1974.

A series of 90 patients (aged 23-77 yr) with achlorhydric autoimmune atrophic gastritis has been followed from 1-15 yr (mean 6 yr). During this time a total of 17 patients (19%) developed malabsorption of vitamin B_{12}. The interval between the diagnosis of atrophic gastritis and the development of vitamin

B_{12} malabsorption varied from 1-15 yr. Of these 90 patients, 20 (22%) had serum-type-I intrinsic-factor antibody; and, of these 20, 7 (35%) developed vitamin B_{12} malabsorption during follow-up. However, an appreciable number of patients without serum type-I intrinsic-factor antibody also developed vitamin B_{12} malabsorption. Serial serum intrinsic-factor antibody titers were of no value in predicting those patients liable to develop vitamin B_{12} malabsorption. These findings strongly suggest that factors other than the presence or titer of serum antibody to intrinsic factor, or to gastric parietal-cell microsomal antigen, are involved in the progression of achlorhydric atrophic gastritis to vitamin B_{12} malabsorption. In conclusion, this study demonstrates the slow but steady progression of achlorhydric atrophic gastritis to pernicious anemia in a group of patients presenting with endocrine disorders.

0402 ATROPHIC GASTRITIS AND ITS SEQUELAE. RESULTS OF 19-23 YEARS' FOLLOW-UP EXAMINATIONS. *(E.)* Siurala, M.; Lehtola, J.; Ihamaki, T. (Meilahti Hosp., Helsinki, Finland). *Scand. J. Gastroenterol.* 9(5):441-446, 1974.

Follow-up studies were performed on 116 subjects with atrophic gastritis. The mean follow-up time was 21 yr and the mean age of the patients at reexamination was 64 yr. Of the original 116 subjects, 34 died, leaving 82 patients to be studied during this last re-examination. Of these 82, 28 patients died during the follow-up period due to: gastric carcinoma (2); colonic cancer (1); pulmonary cancer (2); ovarian cancer (1); cerebral tumor (1); abdominal cancer (1); cardiovascular disease (15); and other diseases (5). One of the patients who died of gastric carcinoma had been so diagnosed during the previous follow-up period 8 yr prior to death. Of the remaining 54 patients, re-examinations were performed on 35. Gastroscopy disclosed polypoid lesions in 6 cases (true adenomas in 2, hyperplasias in 3, and inflammatory polyp in 1). Multiple direct vision gastric biopsy from the antrum and the body revealed that gastritic changes were somewhat more pronounced in the body than in the antrum. Moderate or severe epithelial atypia was present in 13 of the 35 biopsied cases. Parietal cell antibodies were found in 3 and intrinsic factor antibodies in an additional 2 cases. Serum gastrin values were above 75 pM/liter in 24 cases and in 1 out of 24 controls. Serum vitamin B_{12} levels were within normal limits in all cases. Many patients suffered abdominal discomfort. Epigastric complaint or difficulty associated with food intake was present in 18. There were 14 patients who appeared essentially symptomless with regard to abdominal organs. There was no correlation between the subjective complaints and the morphological state of the antral or body mucosa. Although atrophic gastritis preceded the occurrence of gastric tumors in all cases diagnosed during the time of observation, sources of error inherent in the present follow-up method disallow the conclusion that atrophic gastritis is in general a precancerous condition.

0403 ASPIRIN INDUCED GASTRIC MUCOSAL INJURY IN RATS AND ADENYL CYCLASE. *(E.)* Mangla, J. C.; Kim, Y. M.; Rubulis, A. A. (Monroe Community Hosp., Rochester, N.Y.). *Biochem. Med.* 11(4):376-382, 1974.

The effect of aspirin on gastric mucosal adenyl cyclase in male Holtzman rats was studied. Rats were given aspirin (150-300 mg/kg, by stomach tube) after an overnight fast. The mucosa of the stomach was examined after a given time ranging from 5 min to 5 hr. The mucosa appeared congested, red, hemorrhagic with many erosions. The effect of aspirin became apparent as early as 5 min after the oral dose with maximal adenyl cyclase stimulation noted at 4 hr. For *in vitro* studies, gastric mucosal homogenate was treated with aspirin dissolved in methyl cellulose at concentrations of 0.3, 0.6, 0.9, and 1.8 mm/0.38 ml of reaction mixture. Again adenyl cyclase stimulation was observed and a direct correlation between aspirin concentration and the degree of adenyl cyclase activity was noted. Adenyl cyclase activity increased linearly with aspirin concentration from 0.3 mg up to 1.8 mg in .38 ml reaction mixture. The stimulation of adenyl cyclase by aspirin may exhaust the ATP stores quickly, causing mucosal injury.

0404 THE PROBLEM OF "EARLY GASTRIC CANCER". *(Sp.)* Herrerias, J. M.; Aljama, P.; Jimenez Pereperez, J. A.; Damiano, A.; Osorio, M.; Nararro y Esteban, F. (Fac. Med. Univ. Sevilla, Cadiz, Spain). *Rev. Esp. Enferm. Apar. Dig.* 44(2): 157-166, 1974.

0405 COMPARISONS BETWEEN NEUTRON AND TELECOBALT THERAPIES IN BRONCHIAL, GASTRIC, AND ESOPHAGEAL CARCINOMAS. *(Ger.)* Eichhorn, H. J.; Lessel, A.; Matschke, S. (Cent. Inst. Cancer Res., Berlin-Buch, Germany). *Strahlentherapie* 147(6):559-563, 1974.

0406 CARCINOMA IN THE GASTRIC STUMP FOLLOWING RESECTION FOR BENIGN DISEASE: A CRITICAL EVALUATION. *(Ger.)* Peters, H.; Schubert, H. J.; Reifferscheid, M. (Med. Fac., Rhenish Westphalian Tech. Coll., Aachen, Germany). *Langenbecks Arch. Chir.* 336(3):219-233, 1974.

0407 MENETRIER'S DISEASE WITH MALIGNANT DEGENERATION TREATED BY TOTAL GASTRECTOMY. *(Fr.)* Braillon, G.; Boulanger, J. P. (Jules Courmont Hosp., Pierre-Benite, France). *Lyon Chir.* 70(5): 326-327, 1974.

0408 THE RELATIONSHIP BETWEEN CHRONIC GASTRITIS, GASTRIC ULCERATION AND CARCINOMA OF THE STOMACH. A HISTORICAL REVIEW. *(E.)* Bock, O. A. A. (Tygerberg Hosp., Tiervlei, South Africa). *S. Afr. Med. J.* 48(49):2063-2066, 1974.

0409 CHRONIC GASTRITIS IN THE MONGOLIAN PEOPLE'S REPUBLIC. *(Ger.)* Wolff, G.; Badral, Z.; Jamin-Scharav (Cent. Inst. Cancer Res., Berlin, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 33(1): 37-39, 1974.

0410 TREATMENT OF HEMORRHAGIC GASTRITIS BY THE ENDOSCOPIC APPLICATION OF ACRYLIC POLYMER. *(E.)* Keller, R. T.; Logan, G. M. (Univ. North Dakota Sch. Med., Grand Forks). *Gastrointest. Endosc.* 21(2):75-76, 1974.

0411 ENDOSCOPIC DIAGNOSIS OF GASTRIC EROSIONS AND THEIR CLINICAL SIGNIFICANCE. *(Ger.)* Bosseckert, H.; Koppe, P.; Heid, R. (Med. Clin., Friedrich Schiller Univ., Jena, Germany). *Z. Gesamte Inn. Med.* 29(21):888-891, 1974.

0412 POSTOPERATIVE AND STRESS BLEEDING. *(Ger.)* Farthmann, E.; Horatz, K. (Surg. Clin., Univ. Hamburg, Germany). *Langenbecks Arch. Chir.* 337:541-545, 1974.

0413 PEPTIC ULCERS WHICH DEVELOPED AND WERE CURED DURING UNINTERRUPTED CORTICOSTEROID THERAPY: 11 CASES. *(Fr.)* Etienne, J. P.; Labayle, D.; Chaput, J. C.; Buffet, C. (Antoine Beclere Hosp., Clamart, France). *Ann. Med. Interne (Paris)* 125(11): 823-829, 1974.

0414 METABOLIC CHANGES IN GASTRECTOMIZED PATIENTS. *(Por.)* Ribeiro, E. B. (Sao Lucas Sanit., Sao Paulo, Brazil). *Bol. Sanatorio Sao Lucas* 35(6):119-120, 1974.

0415 SOME ASPECTS OF CARBOHYDRATE METABOLISM IN PATIENTS WITH DUMPING SYNDROME. *(Pol.)* Lubczynska-Kowalska, W. (Acad. Med., Wroclaw, Poland). *Pol. Tyg. Lek.* 29(33):1447-1450, 1974.

0416 NEONATAL GASTRIC PERFORATION NOT CAUSED BY CONGENITAL MUSCULAR DEFECTS. *(E.)* Priebe, Jr., C. J.; Mangahas, T.; Garret, R. (Roosevelt Hosp., New York, N. Y.). *Arch. Pathol.* 98(6): 422-425, 1974.

0417 RELATIONSHIPS BETWEEN THE INDICES OF THE STOMACH ELECTRICAL ACTIVITY IN CERTAIN PATHOLOGICAL CASES. *(E.)* Altuparmakov, I. A.; Mizhorkova, Z. N. (Med. Acad. Sofia, Bulgaria). *Dokl. Acad. Nauk (Bulg.)* 27(7):999-1002, 1974.

0418 ISOLATED HODGKIN'S DISEASE OF THE STOMACH. *(Ger.)* Takacsi-Nagy, L. (Emil Weil Inst. Cancer Radiol., Budapest, Hungary). *Strahlentherapie* 147(5):477-481, 1974.

0419 ELECTRON MICROSCOPE STUDY OF HUMAN GASTRIC MUCOSA IN A CASE OF HEMOCHROMATOSIS. *(Pol.* Domagala, W.; Marlicz, K. (Pomeranian Acad. Med. Szczecin, Poland). *Patol. Pol.* 25(1):153-158, 1974.

0420 ANTRUM MORPHOLOGY AND SERUM GASTRIN LEVEL IN ACHLORHYDRIA. *(Ger.)* Miederer, S. E.; Kutz, K.; Lindstaedt, H.; Stadelmann, O.; Vetter, H.; Wobser, E.; Elster, K. (Med. Polyclin., Univ. Bonn, Germany). *Dtsch. Med. Wochenschr.* 100(2):51-53, 1975.

See also, 0332, 0349, 0350, 0351, 0352, 0353, 0424, 0425, 0426, 0430, 0431, 0448, 0458, 0497, 0718, 0736, 0748, 0803.

STOMACH

Peptic Ulcers

0421 A FOLLOWUP REPORT OF A PROSPECTIVE EVALUATION OF VAGOTOMY-PYLOROPLASTY AND VAGOTOMY-ANTRECTOMY FOR TREATMENT OF DUODENAL ULCER. *(E.)* Jordan, Jr., P. H. (Baylor Coll. Med., Houston, Tex.). *Ann. Surg.* 180(3):259-264, 1974.

Two evaluation studies were done on 200 patients treated for duodenal ulcer at 3-5 and 5-8 yr after surgery. Truncal vagotomy and drainage was performed on 108 (with 2% mortality) and 92 cases had truncal vagotomy and antrectomy (no mortality). A complete study was done on 94% of all patients, including 30 who died of unrelated causes before completion. Gastrointestinal symptoms were about equal for both groups when the 1st evaluation was done, but symptoms appeared to occur less in the vagotomy and drainage group at the time of the second evaluation. However, it was noted that a total of 9 patients in the vagotomy and drainage group had been reoperated for recurrent ulcer as opposed to only 1 patient in the vagotomy and antrectomy group. To assess completeness of vagotomy, insulin stimulation tests were performed on 183 patients 937 times (6 months-8 yr postsurgery). There were 42% and 86% negative results in the vagotomy and drainage and in the vagotomy and antrectomy, resp. The basal acid output and response to histalog stimulation were significantly reduced in both groups of patients, though greater in the vagotomy and antrectomy cases. It is concluded that the vagotomy and antrectomy procedure is superior in view of the fewer recurrences.

0422 THE PANCREATIC EXOCRINE SECRETION IN DUODENAL ULCER PATIENTS BEFORE AND AFTER SELECTIVE PROXIMAL VAGOTOMY OF THE STOMACH. *(E.)*

Berstad, A.; Roland, M.; Petersen, H.; Liavag, I. (Deaconess Hosp., Oslo, Norway). *Scand. J. Gastroenterol.* 9(5):431-436, 1974.

Pancreatic response to varying doses of exogenous secretin was examined in 11 duodenal ulcer patients (2 women and 9 men, aged 27-60 yr) before and after selective proximal vagotomy and in 12 healthy subjects. Gastric and duodenal secretions were collected during i.v. infusion of secretin in step-wise increasing doses of 0.08, 0.233, 0.7, and 2.1 CU/kg/hr. Bicarbonate output was lower at all doses in patients than in controls, significantly so for the 0.23 CU/kg/hr dose. The maximal response was the same in patients and controls (0.33 mEq/kg/30 min). The dose of secretin giving half-maximal response was 0.41 CU/kg/hr in controls and 0.62 CU/kg/hr in patients. Bicarbonate output increased, but not significantly after selective proximal vagotomy in response to the 3 lowest doses of secretin. The mean response to the highest dose of secretin decreased significantly from 17.3 to 15.6 mEq/30 min after operation. The maximal response of 0.28 mEq/kg/30 min after vagotomy was not significantly different than that before operation. The dose of secretin giving half-maximal response after vagotomy was 0.35 CU/kg/hr, significantly lower than before, but not significantly different from control values. The output of proteolytic enzymes in response to the 2 lowest doses of secretin before operation was significantly higher in patients than in controls. After operation the enzyme output was higher following administration of the 2 highest doses, significantly so at the 0.7 CU/kg/hr level. In duodenal ulcer patients the enzyme output before vagotomy remained at the same level following the 3 lowest doses of secretin and increased significantly with the highest dose. After operation, the curve started rising significantly with the second highest dose. These results suggest a lower sensitivity of the bicarbonate-secreting cells of the pancreas in duodenal ulcer patients, and that the sensitivity is increased by selective proximal vagotomy. Also, for enzyme secretion, the operation apparently shifts the dose-response curve to the left. There may be a greater leakage of bile into the duodenum in duodenal ulcer patients, even more so after selective vagotomy, than in normal persons.

0423 PREVENTION OF RESTRAINT AND INDOMETHACIN-INDUCED GASTRIC ULCERATION BY BILE DUCT OR PYLORUS LIGATION IN RATS. *(E.)*

Hemmati, M.; Abtahi, F.; Farrokhsiar, M.; Djahanguiri, B. (Sch. Med., Univ. Tehran, Iran). *Digestion* 10:108-112, 1974.

The influence of bile duct and pylorus ligation was investigated on two experimental models of gastric ulceration: restraint- and indomethacin-induced gastric mucosal ulcerations in rats of both sexes. Animals were divided into 6 groups of 40 rats as follows: (1) restraint; (2) restraint + bile administration; (3) indomethacin (40 mg/kg i.p.); (4) indomethacin + bile; (5) bile alone; and (6) saline. In bile duct-ligated rats, 10% of the restrained and none of the indomethacin treated animals showed gastric ulceration. These figures were 10% and 50% resp. in pylorus-ligated rats. Administration of bile to restrained and indomethacin-treated rats nullified the preventive effect of bile duct or pylorus ligation, suggesting that the preventive effect was due to the lack of bile reflux into the stomach. However, the possible role of bile duct ligation or pylorus ligation in reducing gastric secretion of acid should not be disregarded. The failure of pylorus ligation to completely prevent indomethacin-induced ulcerations may be due to a direct effect of the drug on the stomach. Bile salts have been shown to be cytolytic, to damage the gastric mucosa, to release gastrin, and to cause gastric ulceration; but the precise mechanism whereby the presence of bile in the stomach promotes the pathogenesis of gastric ulceration following stress or indomethacin is not clear.

0424 EXPERIMENTAL STRESS ULCERS IN ACIDOTIC AND NONACIDOTIC RENAL INSUFFICIENCY. *(E.)*

Fischer, R. P.; Peter, E. T.; Mullane, J. F. (Albuquerque VA Hosp., N.M.). *Arch. Surg.* 109(3): 409-411, 1974.

The study of stress ulcer pathogenesis (with the restraint method of Brodie and Hanson used as the model) was performed on groups of rats which exibited acidotic and non-acidotic renal insufficiency. Two experiments several months apart were performed on control and experimental Sprague-Dawley rats (200-225 g). For 24 hr prior to restraint the rats received water but no food. They were slightly anesthetized with ether and restrained. In one experiment the rats were restrained for 11 hr and in another experiment, for 24 hr. Acidotic renal insufficiency was induced in the experimental group by a single i.p. injection of 4 mg/100 ml uranyl nitrate. Controls received saline (0.5 ml/100 g, i.p.). Four days after injection the rats were restrained. The uranyl rats were severely acidotic (mean pH 7.19) and hyperkalemic (mean potassium concentration 5.4 mEq/liter). Erosions (3 or more) were present in 12 experimental and 3 control rats. One or more ulcers were found in 10 experimental and 3 control rats. Acidotic hyperkalemic renal insufficiency thus enhances restraint-induced stress ulcers. Non-acidotic renal insufficiency was induced in rats by partial nephrectomy performed on the experimental rats on the 1st day, while on the same day the controls underwent sham flank operations. Eight days later, contralateral nephrectomies were done on both the experimental and control rats. All were restrained on the 14th day. Blood urea nitrogen (BUN) levels were slightly if at all elevated in the controls after contralateral nephrectomy and only a few were significantly uremic by the day of restraint. One or more gastric erosions were present in 12 experimental and 4 control rats; 1 or more ulcers were found in 5 experimentals and 1 control rat. These rats were not acidotic nor hyperkalemic, but did have moderate uremia (average BUN level 111.6 mg/100 ml) and it appeared that this enhanced the restraint-induced stress erosion and ulcer formation in this group. In a separate set of experiments, both groups were duplicated but the rats were killed without restraint. The latter had no gastric ulcers and only an average of 0.17 erosions/rat. It is concluded that renal insufficiency interferes with normal gastric mucosal repair and that erosive gastritis is an integral component of uremic enterocolitis found in severely uremic patients.

0425 HYPERGLUCAGONEMIA, HYPOCALCEMIA AND DIMINISHED GASTRIC BLOOD FLOW: EVIDENCE FOR AN ETIOLOGICAL ROLE IN STRESS ULCER OF RAT. *(E.)* Schwille, P. O.; Schellerer, W.; Reitzenstein, M.; Hermanek, P. (Dep. Surg., Univ. Erlangen-Nuremberg, Erlangen, Germany). *Experientia* 30(7):824-826, 1974.

Three groups of male Wistar rats of 200 g each were randomly divided into intact, sham operated (laparotomy only) and adrenalectomized animals. One moiety served as control and the other half was stressed by restraint for 24 hr. Food and water were withheld for 24 hr prior to experiment (controls). Following stress, all animals were anesthetized and laparotomized to expose the gastric surface and allow bleeding from the aorta. Oxygen pressure determination was performed by polarography. Radioimmunoassay measured the values of pancreatic glucagon and gastrin. Serum calcium was determined by EDTA titration. The ulcer index (UI) according to Brodie and Hanson served as a criterion for gastric lesions induced by stress. Intact and sham-operated rats had zero UI and nearly equal oxygen pressure values (19.08 *versus* 18.58). Both stress alone and adrenalectomy alone severely increased the UI and reduced gastric perfusion, the lowest oxygen pressure being found in adrenalectomized rats following stress. Pancreatic glucagon in stressed rats was definitely elevated (corroborating the view that catecholamines are potent stimuli to α-cells). Immunoassayable gastrin tended to decline during stress but increased markedly after adrenalectomy. Serum calcium was diminished in stressed animals with the exception of those who had undergone adrenalectomy. It is suggested that gastric ulcers originally induced by stress situations can be characterized by a triad of hyperglucagonemia, hypocalcemia and reduced gastric mucosa blood supply.

0426 STARVATION, GLUCOSE, AND STRESS ULCERS IN THE RAT. *(E.)* Mullane, J. F.; Pyant, Jr., R. L.; Wilfong, R. C.; Dailey, W. (Walter Reed Army Inst. Res., Washington, D.C.). *Arch. Surg.* 109(3):416-419, 1974.

Male Wistar rats (35-120 g) were divided into several groups with similar mean weights. The control group had free access to food and water until 20 hr prior to restraint, when food was removed. The experimentally starved rats received only water for 96 hr before restraint. During this 96 hr period the rest of the groups received 1.0, 2.5 and 5.0 g/100 ml concentrations of glucose in their drinking water but no food. The control rats received 39 calories/day; the group receiving 5.0 g had 13 calories. All rats were restrained for a period of 7 hr; they were then sacrificed and their stomachs removed and examined. The evaluation was done for two groups: one consisted of controls, starvation and 5.0 g/100 ml of glucose ingestion; the other group was composed of controls, 1.0, 2.5 and 5.0 g/100 ml glucose ingestion. The starved rats had the largest number of restraint induced gastric erosions and were closely followed by the groups that received 1.0 and 2.5 g/100 ml of glucose. The erosions found in the group that received 5.0 g/100 ml were about the same in number as in the control group. It appears that a critical degree of caloric intake does protect the gastric mucosa from the effects of stress.

0427 DIAGNOSIS OF PYLORODUODENAL ULCERS BY RADIOLOGY AND ENDOSCOPY. *(Fr.)* Realini, S.; Bugnion, M.; Fluckiger, A.; Hofstetter, J. R. (Med. Polyclin., Univ. Lausanne, Switzerland). *Schweiz. Med. Wochenschr.* 105(1):19-20, 1975.

0428 OTHER PERSPECTIVES FOR EXPLAINING THE PATHOGENESIS OF PEPTIC ULCER. *(Por.)* Ribeiro, E. B. (Sao Lucas Sanit., Sao Paulo, Brazil). *Bol. Sanit. Sao Lucas* 36(2):45-48, 1974.

0429 DEGLYCYRRHIZINISED LIQUORICE: A REPORT OF ITS PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC EFFICACY IN PEPTIC ULCER. *(E.)* Brogden, R. N.; Speight, T. M.; Avery, G. S. (Australasian Drug Inf. Serv., Auckland, New Zealand). *Drugs* 8(5):330-339, 1974.

0430 CURATIVE ACTIVITY OF A SULPHATED POLYGALACTOSIDE (CP1200) ON EXPERIMENTAL GASTRIC ULCERS IN THE RAT. *(E.)* Lambelin, G.; Roba, J. (Res. Lab., Machelen, Belgium). *Arch. Int. Pharmacodyn.* 211(1):18-23, 1974.

0431 EXPERIENCE WITH METOCLOPRAMIDE IN GASTROINTESTINAL DISEASE: CLINICAL STUDY AND INVESTIGATION OF SIDE EFFECTS IN 1000 ORIGINAL CASES. *(Sp.)* Fornes Pons, J. (no affil.). *Rev. Esp. Enferm. Apar. Dig.* 44(4):421-428, 1974.

0432 MEDICAL AND SURGICAL THERAPY FOR PEPTIC ULCER. *(It.)* Pezzuoli, G.; Spina, G. (Inst. Surg. Pathol., Univ. Padua, Italy). *Clin. Eur.* 12(5):431-439, 1974.

0433 HIGHLY SELECTIVE VAGOTOMY. *(E.)* Johnston, D. (Gen. Infirm., Leeds, England). *Gut* 15(9):748-757, 1974.

0434 PROXIMAL GASTRIC VAGOTOMY. *(E.)* Wastell, C.; Wilson, T.; Pigott, H. (Gordon Hosp., London, England). *Proc. R. Soc. Med.* 67(11):1183-1185, 1974.

0435 ACCIDENTS AND COMPLICATIONS IN SELECTIVE AND PROXIMAL GASTRIC VAGOTOMY. *(E.)* Kalaja, E.; Clemmesen, I.; Banke, L.; Kragelund, E.; Christiansen, P. M. (Bispebjerg Hosp., Copenhagen, Denmark). *Surgery* 77(1):140-143, 1975.

0436 PYLORUS-PRESERVING GASTRECTOMY FOR GASTRIC ULCER—ONE- TO NINE-YEAR FOLLOW-UP STUDY. *(E.)* Sekine, T.; Sato, T.; Maki, T.; Shiratori, T. (Tohoku Univ. Sch. Med., Sendai, Japan). *Surgery* 77(1):92-99, 1975.

0437 ULCERS IN THE UPPER POLE OF THE STOMACH: SURGICAL PROBLEMS. *(Fr.)* Edelmann, G.; Boutelier, P.; Champault, G. (Bichat Hosp., Paris, France). *Lyon Chir.* 70(5):299-302, 1974.

0438 COMMON MESENTERY DIAGNOSED DURING SURGICAL TREATMENT OF A STOMACH ULCER. *(Fr.)* Loup, J. (Hosp. Cent., Auch, France). *Lyon Chir.* 70(5): 325-326, 1974.

0439 THE EFFECT OF KNOWN COMPLETE HEALING ON THE NATURAL HISTORY OF CHRONIC GASTRIC ULCER. *(E.)* Greig, M.; Hobbin, E.; Hunt, J.; Coupland, G. A. E.; Piper, D. W. (R. North Shore Hosp., Sydney, Australia). *Aust. NZ J. Med.* 4(3):302, 1974.

0440 FISTULAS BETWEEN THE GALLBLADDER, COMMON BILE DUCT, AND DUODENUM AS A COMPLICATION OF CHRONIC DUODENAL ULCER. *(Ger.)* Haas, D.; Vogt, B. (Cantonal Hosp., Lucerne, Switzerland). *Helv. Chir. Acta* 41(5/6):799-801, 1974.

0441 MASSIVE HEMORRHAGE FROM GASTRIC AND DUODENAL ULCERS: EMERGENCY THERAPY. *(Ger.)* Eichfuss, H. P.; Soehendra, N.; Wehling, D. (Surg. Clin., Univ. Hamburg, Germany). *Dtsch. Med. Wochenschr.* 99(35):1732-1734, 1974.

0442 GASTROPLEGIA SECONDARY TO VAGOTOMY. *(Fr.)* Larcan, A.; Laprevote-Heully, M. C.; Lambert, H.; Fieve, G.; Fresse, A. (Univ. Hosp. Cent., Nancy, France). *Arch. Fr. Mal. App. Dig.* 63(4):315-318, 1974.

0443 MORPHOLOGICAL FEATURES AND ABSORPTIVE FUNCTION OF MUCOSA IN THE EMPTY INTESTINE AFTER PARTIAL GASTRECTOMY FOR PEPTIC ULCER. *(Pol.)* Szklanny, J. (Acad. Med. Lodz, Poland). *Pol. Tyg. Lek.* 30(40):1715-1718, 1974.

0444 FUNCTIONAL AND HISTOMORPHOLOGICAL CHANGES IN THE LIVER IN PEPTIC ULCER. *(Ger.)* Temelkov, S.; Badakov, S. (I. P. Pavlov Higher Med. Inst., Plovdiv, Bulgaria). *Folia Med. (Plovdiv)* 15(4):207-214, 1973.

0445 CYTOCHEMICAL CHANGES OF ENTEROCHROMAFFINE-LIKE [SIC!] CELL IN THE EXPERIMENTAL GASTRIC ULCERS. *(E.)* Mori, J.; Fujiwara, M. (Fujisawa Res. Lab., Osaka, Japan). *Acta. Histochem. Cytochem.* 7(1):79-80, 1974.

0446 CHANGES IN THE SERUM ALKALINE PHOSPHATASE ACTIVITY AND SERUM PROTEINS IN ULCER PATIENTS BEFORE AND AFTER SURGERY. *(Ger.)* Temelkov, S.; Taralov, S. (I. P. Pavlov Higher Med. Inst., Plovdiv, Bulgaria). *Folia Med. (Plovdiv)* 15(5):257-264, 1973.

0447 BLOOD AMMONIA DETERMINATIONS IN GASTRECTOMIZED PATIENTS. *(Ger.)* Schwamberger, K.; Falser, N. (Surg. Clin., Univ. Innsbruck, Austria). *Langenbecks Arch. Chir.* 335(4):351-357, 1974.

0448 CURRENT POSSIBILITIES OF RESEARCH AND SIGNIFICANCE OF THE GASTRIC MUCOSAL BARRIER. *(E.)* Barbara, L.; Miglioli, M.; Baldi, F.; Cornia, G. L.; Labo, G. (Inst. Pathol. Med. I, Univ. Bologna, Italy). *Rend. Gastroenterol.* 5(3):217-218, 1973.

See also, 0045, 0096, 0103, 0333, 0347, 0408, 0417, 0486, 0718, 0729.

SMALL INTESTINE

0449 MALIGNANCY, WEIGHT LOSS, AND THE SMALL INTESTINAL MUCOSA. *(E.)* Barry, R. E. (Bristol R. Infirm., England). *Gut* 15(7):562-570, 1974.

The mucosal architecture and dynamics of the small bowel were studied in 2 groups of patients. One group consisted of patients with malignant disease not of the gastrointestinal tract, but associated with severe weight loss (mean 21 lb). The 2nd group consisted of patients who had lost at least 28 lb for reasons other than malignant or gastrointestinal disease. Mucosal architecture in malignant disease was significantly different from normal. The presence of cylindrically shaped villi and more than 1 leaf-shaped villus were diminished in malignancy, while the incidence of ridges and convolutions increased in groups with malignancies or wasting illness of another type. The mean mucosal thickness in normal controls was 522 μ which was reduced to 443 μ in patients with malignant disease. Similar decreases were noted in patients with wasting diseases other than malignancy. The malignant group showed a significant decrease in the rate of lactose absorption. The epithelial cell (DNA) loss rate from intestinal mucosa was decreased in patients with malignant and other wasting diseases. As there must be dynamic equilibrium between the rates of epithelial cell production by the crypts and their loss from the villi, then the epithelial cell turnover is likely to be reduced as well. This implies that the architectural changes observed in the jejunum of patients with malignant disease are caused by hypoplasia of the mucosa.

0450 PROTEIN-LOSING ENTEROPATHY IN PRIMARY LYMPHOEDEMA: MESENTERIC LYMPHOGRAPHY AND GUT RESECTION. *(E.)* Kinmonth, J. B.; Cox, S. J. (St. Thomas's Hosp. Med. Sch., London, England). *Br. J. Surg.* 61(8):589-593, 1974.

Three patients (a 14-yr-old girl and 2 men aged 52 and 54 yr) with primary lymphoedema of the small bowel and exudative enteropathy were investigated with mesenteric as well as pedal lymphography. Presenting symptoms included, resp., edema of legs and genitalia, edema of legs, and edema of genitalia. Two patients had fatty diarrhea. Gut protein loss, measured by the chromium chloride test, was 18.4, 10.8, and 2.5%, resp. Serum albumin measured 2.8, 2.9, and 3.8% while serum calcium was 4.9, 6.9, and 7.9%. Mesenteric lymphograms showed obstruction to gut drainage with no flow of dye to the cysterna chyli or thoracic duct. Additionally, lymphovenous shunting of dye to the liver was observed in 1 case. All 3 patients benefited from resection of the worst affected area of the gut (1-2 1/2 ft), followed in 2 cases by an end-to-end anastomosis. The protein loss in these patients was evidently due to exudation into the peritoneal cavity or into the gut lumen. The fatty diarrhea in 2 patients may have resulted from buildup of fat in lymph pathways, which became packed with chyle. At this stage fat absorption from the gut would slow or cease and fatty diarrhea ensue. The hypocalcemia may have arisen in association with the low plasma proteins. Additionally, excessive loss of calcium from the gut by a formation of insoluble soaps would be expected due to disordered fat absorption.

0451 RATE OF SYNTHESIS OF ALBUMIN IN RELATION TO SERUM LEVELS OF ESSENTIAL AMINO ACIDS IN PATIENTS WITH BACTERIAL OVERGROWTH IN THE SMALL BOWEL. *(E.)* Yap, S. H.; Hafkenscheid, J. C. M.; van Tongeren, J. H. M.; Trijbels, J. M. F. (Div. Gastroenterol., Univ. Nijmegen, Netherlands). *Eur. J. Clin. Invest.* 4(4):279-284, 1974.

In 11 patients bacterial overgrowth in the small intestine was confirmed by a breath test with 1-^{14}C-glycocholic acid and by counts of bacteria in jejunal juice. The patients had strictures of the jejunum or ileum due to Crohn's disease (5), small bowel diverticulosis (2), postgastrectomy diarrhea (2), celiac disease (1), and blind loop syndrome (1). Serum albumin concentrations were reduced (21.9-42.9 g/liter) in all but 1 patient. No relation could be demonstrated between the low albumin concentrations and the extent of gastrointestinal protein loss. The rate of albumin synthesis, determined by the ^{14}C-carbonate method, was significantly lower in the 11 patients compared with controls. The rate was positively correlated with serum levels of valine, isoleucine, leucine, and tryptophan: when the serum levels of these 4 essential amino acids were low, the rate of albumin synthesis was depressed. The reduction in serum amino acids was apparently the result of bacterial degradation of dietary amino acids, or malabsorption or low intake of amino acids.

0452 CARCINOID TUMORS OF THE GASTROINTESTINAL TRACT. *(E.)* Morgan, J. G.; Marks, C.; Hearn, D. (Louisiana State Univ. Sch. Med., New Orleans). *Ann. Surg.* 180(5):720-727, 1974.

0453 CARCINOID AND CARCINOID SYNDROME. *(Ger.)* Porst, H.; Naas, W.; Renger, F.; Dokert, B.; Platzbecker, H. (Carl Gustav Carus Med. Acad., Dresden, Germany). *Gesamte Inn. Med.* 29(15):635-638, 1974.

0454 LEIOMYOMA OF THE JEJUNUM AS THE CAUSE OF AN ACUTE ABDOMINAL CONDITION: REPORT OF A CASE. *(E.)* Goren, G.; Zelikowski, A.; Abu-Dalu, J.; Urga, I. (Beilinson Hosp., Petah Tiqua, Israel). *Dis. Colon Rectum* 17(6):782-785, 1974.

0455 PRIMARY ADENOCARCINOMA OF THE JEJUNUM AND COEXISTING PRIMARY ADENOCARCINOMA OF THE VERMIFORM APPENDIX: A CASE REPORT. *(E.)* Coblentz, M. G.; Filippone, D. R. (St. Barnabas Med. Cent., Livingston, N. J.). *Surgery* 77(1):160-164, 1975.

0456 MALIGNANT LYMPHOMA OF THE JEJUNUM IN A PATIENT WITH WISKOTT-ALDRICH SYNDROME. SURGICAL TREATMENT. *(E.)* Faraci, R. P., Hoffstrand, H. J.; Witebsky, F. G.; Blaese, R. M.; Beazley, R. M. (Natl. Cancer Inst., Bethesda, Md.). *Arch. Surg.* 110(2):218-220, 1975.

0457 NODULAR LYMPHOID HYPERPLASIA OF THE SMALL INTESTINE. *(E.)* Gerson, C. D.; Marshak, R. H.; Lindner, A. E. (Mt. Sinai Sch. Med., City Univ. New York, N.Y.). *Am. J. Gastroenterol.* 62(4):371-376, 1974.

0458 AN EXPERIMENTAL MODEL FOR ASSESSING THE RADIOPERTECHNETATE DIAGNOSIS OF GASTRIC MUCOSA IN MECKEL'S DIVERTICULUM. *(E.)* Keramidas, D. C.; Coran, A. G.; Zaleska, W. (Los Angeles Cty.-Univ. South. California Med. Cent.). *J. Pediatr. Surg.* 9(6):879-884, 1974.

0459 THREE VARIETIES OF CONGENITAL DIVERTICULUM OF THE INTESTINE. *(E.)* Gray, S. W.; Akin, Jr., J. T.; Skandalakis, J. E. (Emory Univ. Sch. Med., Atlanta, Ga.). *Surg. Clin. North Am.* 54(6):1371-1377, 1974.

0460 SURGICAL PROBLEMS OF DUODENAL DIVERTICULA. *(Ger.)* Gober, I.; Strahberger, E. (2nd Surg. Clin., Univ. Vienna, Austria). *Wien. Klin. Wochenschr.* 86(15):433-436, 1974.

0461 PATHOPHYSIOLOGY AND CURRENT TREATMENT OF INTESTINAL OBSTRUCTION. *(E.)* Nadrowski, L. F. (no affil.). *Rev. Surg.* 31(6):381-407, 1974.

0462 SEQUELAE OF ILEUS TREATED SURGICALLY IN NEWBORNS OR INFANTS. *(Ger.)* Stroder, J.; Jeschke, R.; Fuchs, G.; Hardt, H.; Mingers, A. (Pediatr. Clin., Univ. Wurzburg, Germany). *Monatschr. Kinderheilk.* 122(7):707-709, 1974.

0463 SELECTIVE MASSIVE AMYLOIDOSIS OF SMALL INTESTINE. *(E.)* Griffel, B.; Man, B.; Kraus, L. (Meir Hosp., Kfar Saba, Israel). *Arch. Surg.* 110(2):215-217, 1975.

0464 THE ANATOMIC BASIS OF VASCULAR COMPRESSION OF THE DUODENUM. *(E.)* Akin, Jr., J. T.; Skandalakis, J. E.; Gray, S. W. (Piedmont Hosp., Atlanta, Ga.). *Surg. Clin. North Am.* 54(6):1361-1370, 1974.

0465 TRAUMATIC INJURIES TO THE DUODENUM: A REPORT OF 98 PATIENTS. *(E.)* Corley, R. D.; Norcross, W. J.; Shoemaker, W. C. (Hektoen Inst. Med. Res., Cook Cty. Hosp., Chicago, Ill.). *Ann. Surg.* 181(1):92-98, 1975.

0466 RETROPERITONEAL DUODENAL INJURY RESULTING FROM BLUNT ABDOMINAL TRAUMA. *(E.)* Doeven, J. J. (Surg . Clin., State Univ., Groningen, Netherlands). *Arch. Chir. Neerl.* 26(4):299-310, 1974.

0467 PNEUMOPERITONEUM SECONDARY TO ACUTE PERFORATION OF A TUBERCULOUS ULCER OF THE SMALL INTESTINE. A REPORT OF TWO CASES. *(E.)* Seliger, G.; Pinto, R. S. (New York Univ.-Bellevue Med. Cent., N. Y.). *Am. J. Gastroenterol.* 62(5):430-434, 1974.

0468 PRIMARY NONSPECIFIC SMALL BOWEL ULCERATION AS A SOURCE OF CHRONIC BLEEDING. REPORT OF A CASE AND REVIEW OF THE APPROACH TO LOCALIZATION OF THE SITE OF SMALL BOWEL HEMORRHAGE. *(E.)* Graham, D. Y.; Bynum, T. E. (Baylor Coll. Med., Houston, Tex.). *Am. J. Gastroenterol.* 62(4):350-355, 1974.

0469 BLEEDING FROM THE SMALL INTESTINE. *(Ger.)* Brunner, H. (Surg. Clin., Univ. Mainz, Germany). *Langenbecks Arch. Chir.* 337:569-575, 1974.

0470 TYPHOID ILEITIS WITH HEMORRHAGE. A CASE REPORT WITH NEW THERAPY. *(E.)* Collins, W. J.; Ball, R. E.; Dorsey, T. J. (St. Joseph Hosp., Orange, Calif.). *Am. J. Dig. Dis.* 20(1):94-96, 1975.

0471 INTESTINAL INFARCTION CAUSED BY ACUTE SPONTANEOUS THROMBOSIS OF THE PORTAL SYSTEM. *(Fr.)* Partensky, C.; Lesbros, F.; Saubier, E. C. (Edouard Herriot Hosp., Lyon, France). *Lyon Chir.* 70(4):261-264, 1974.

0472 ULTRASTRUCTURAL PATHOLOGICAL CHANGES IN INTESTINAL SUBMUCOSAL ARTERIOLES IN ANGIOTENSIN-INDUCED ACUTE HYPERTENSION IN RATS. *(E.)* Thorball, N.; Olsen, F. (Anat. Dep. C, Univ. Copenhagen, Denmark). *Acta Pathol. Microbiol. Scand.* [*A*] 82(6):703-713, 1974.

0473 STAGNANT LOOP SYNDROME RESULTING FROM SMALL-BOWEL IRRADIATION INJURY AND INTESTINAL BY-PASS. *(E.)* Swan, R. W. (William Beaumont Army Med. Cent., El Paso, Tex.). *Gynecol. Oncol.* 2(4):441-445, 1974.

0474 TREATMENT OF GROSS OBESITY BY JEJUNAL BYPASS. *(E.)* Gazet, J. C.; Pilkington, T. R. E.; Kalucy, R. S.; Crisp, A. H.; Day, S. (St. George's Hosp., London, England). *Br. Med. J.* 4(5940):311-314, 1974.

0475 SMALL BOWEL BYPASS IS APPLICABLE FOR ADOLESCENTS WITH MORBID OBESITY. *(E.)* White, J. J.; Cheek, D.; Haller, Jr., J. A. (Johns Hopkins Univ. Sch. Med., Baltimore, Md.). *Am. Surg.* 40(12): 704-708, 1974.

0476 THERAPEUTIC ASPECTS OF THE PATHOLOGY OF INTESTINAL BACTERIA. *(Sp.)* Gaon, D. (no affil.). *Acta Gastroenterol. Latinoam.* 5:23-38, 1974.

See also, 0030, 0304, 0354, 0355, 0356, 0440, 0492, 0493, 0661, 0727, 0735, 0736, 0748, 0755, 0764.

SMALL INTESTINE

Malabsorption

0477 MORPHOLOGICAL AND BIOCHEMICAL CHANGES IN THE MUCOSA OF THE SMALL INTESTINE IN BLIND-LOOP SYNDROME. *(Ger.)* Bloch, R.; Menge, H.; Lorenz-Meyer, H.; Riecken, E. O. (Med. Clin., Univ. Marburg/Lahn, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79: 853-856, 1973.

Morphological and biochemical changes in the mucosa of a 3 cm long, self-filling blind-loop and in the distal and proximal adjoining segments of the rat small intestine were studied 10 to 12 days post operation. The blind-loop was inserted 15 cm below the ligament of Treitz. The measurement of the caprylate absorption revealed significant impairment of the transport function of the mucosa in the distal and proximal segments relative to a normal control. The ratio of the conjugated to free bile acids in the blind-loop and in the rest of the small intestine shifted form the normal value (11:1) to 1:1.7. A significant decrease occurred in the disaccharidase levels and in the enzyme activities. Morphometric examinations revealed pronounced zonal, hyperregenerative transformation of the mucosa, hypertrophic elongation of the villi and crypts, and an enlargement of the crypt zone at the expense of the villous zone. Hypertrophy of the absorptive cells was observed. Changes produced by bile in the mucosa reduce the cell life and lead to an immature absorptive epithelium.

0478 JEJUNAL BRUSH BORDER INJURY AND IMPAIRED SUGAR AND AMINO ACID UPTAKE IN THE BLIND LOOP SYNDROME. *(E.)*

Giannella, R. A.; Rout, W. R.; Toskes, P. P. (Walter Reed Army Inst. Res., Washington, D.C.). *Gastroenterology* 67(5):965-974, 1974.

Small intestinal carbohydrate and amino acid uptake was studied in Walter Reed Carworth Farms male albino rats with blind loop syndrome to determine whether the intestinal epithelium was functionally or biochemically damaged. Rats were surgically equipped with either self-filling or self-emptying jejunal blind loops 10 cm distal to the ligament of Treitz. Absorption of ^{57}Co cyanocobalamin (5 ng) was measured 6-8 weeks after surgery. Normal rats and rats with self-emptying loops absorbed similar amounts of the dose, 64.2% and 62.8%, resp. Rats with self-filling loops absorbed only 25.5%. Both the blind loop and efferent jejunal segments of animals with self-filling blind loops contained significantly greater concentrations of aerobes and anaerobes. Maltase, sucrase, and lactase activities, and 3-*O*-methylglucose and L-leucine uptake were depressed in both the blind loop segment and jejunum distal to the loop in animals with self-filling blind loops. Both the site and severity of these abnormalities paralleled the degree of jejunal bacterial proliferation. After 6 days of either chloramphenicol or neomycin therapy, maltase and sucrase activities returned to normal, but 3-*O*-methylglucose and L-leucine uptake remained depressed. Chloramphenicol did not result in any change in concentration of total aerobes, coliforms, or total anaerobes in the jejunum. However, the obligate anaerobe bacteroides, which were present in very high concentrations, were eliminated. Neomycin therapy slightly reduced the concentration of total aerobes and eliminated aerobic streptococci and staphylococci. These findings indicate that the jejunal epithelial cell function may be abnormal in rats with the blind loop syndrome, resulting in impaired uptake of sugar and amino acid. It is likely that the jejunal brush border has been injured. The fact that this damage can be partly corrected by antibiotic therapy suggests a bacterial factor injurious to small intestinal mucosa.

0479 FAMILY STUDIES IN COELIAC DISEASE. *(E.)*

Mylotte, M.; Egan-Mitchell, B.; Fottrell, P. F.; McNicholl, B.; McCarthy, C. F. (Reg. Hosp., Galway, Ireland). *Q. J. Med., New Series* 43(171): 359-369, 1974.

Peroral duodenojejunal biopsies were performed on 114 of 195 first degree relatives of 31 celiac patients (18 female, 13 male) in 28 families in Western Ireland. Only families in which the intestinal biopsy of the original case showed a flat or flat mosaic pattern when examined with the dissecting, and subtotal villous atrophy with the light microscope, and who showed a favorable clinical response to gluten withdrawal were accepted for the study. Jejunal or duodenal biopsies were done with a Crosby capsule or a modification of it. Mucosa fragments were examined by electron and dissecting microscopes and biochemical analysis. Enzymes analyzed were disaccharidases, leucine-proline hydrolase, enterokinase, and alkaline phosphatase. Quantitative determinations were made of serum immunoglobulins IgG, IgM and IgA by immunodiffusion. The enzyme levels and electron microscopic appearances of the histologically normal mucosa of celiac relatives was not different from that of a control group. Twelve of the 114 biopsies were characteristic of celiac disease. Birth order did not influence the incidence of celiac disease. The mode of inheritance is not typical of simple Mendelian inheritance but is compatible with a polygenic inheritance with a very high heritability or a dominant inheritance with a very low rate of expression in heterozygotes.

0480 LACK OF HARMFUL EFFECT OF OATS ON SMALL-INTESTINAL MUCOSA IN COELIAC DISEASE. *(E.)*

Dissanayake, A. S.; Truelove, S. C.; Whitehead, R. (Radcliffe Infirm., Oxford, England). *Br. Med. J.* 4(5938):189-191, 1974.

Four celiac disease patients who had shown complete mucosal recovery after prolonged treatment of at least 1 yr with a strict gluten-free diet, volunteered to consume oats in addition to their gluten-free diet for 1 month. The oats were consumed at 40-60 g/day as porridge, oat cakes, or flap-jacks. The patients were studied by jejunal biopsy before and after the experimental period. All 4 remained symptom-free throughout the study as there was no appreciable change in the erythrocyte sedimentation rate or in the serum levels of iron, Vitamin B_{12} or folate. The serum IgA and IgM fell below normal in one patient after oats, but random fluctuations in serum immunoglobulins are not unusual in patients on a strict gluten-free diet. The appearances on dissecting and light microscopy remained unchanged. It is suggested that, from the limited knowledge of its chemical composition and antigenicity available currently, oat protein does not closely resemble wheat protein. If the gluten content of oats is related to the amide nitrogen, then 60 g of oats would be equivalent to about 3-6 g of gluten. This study suggests that oat flour is not harmful to the jejunal mucosa of patients with celiac disease.

0481 BACTERIAL COLONISATION OF JEJUNAL MUCOSA IN ACUTE TROPICAL SPRUE. *(E.)* Tomkins, A. M.; Drasar, B. S.; James, W. P. T. (London Sch. Hyg. Trop. Med., England). *Lancet* 1(7898):59-62, 1975.

Numerous aerobic bacteria were closely associated with the mucosal layer of the proximal jejunum in 15 of 16 patients with acute tropical sprue. The patients (3 females and 13 males) registered an average weight loss of 11 kg. Enterobacteria were found in mucosa samples from 11 patients and streptococci were found in mucosa samples of 9. Viable bacteria were found in the luminal fluid of 9 patients: enterobacteria in 8 and streptococci in 3. Concentrations of bacteria in all cases were higher in mucosa samples than in luminal fluid. The species of enterobacteria present in 6 tropical sprue patients were *Alcaligines faecalis* (4), *Enterobacter aerogenes* (5), and *Hafnia* species (3). The incidence of streptococci in patients with acute tropical sprue were not related to mucosal abnormality. Bacteroides were not isolated from any patient. Two patients had lactobacilli in the luminal fluid; one had enterococci in the mucosa, but none had this in the luminal fluid. There were higher counts of enterobacteria in the mucosa of the 9 patients where the finger-shaped villi had been replaced by ridges and convolutions than in the 7 patients with milder changes. The presence of these enterobacteria was accompanied by an apparent decrease in the number of streptococci within the mucosa. The presence of enterobacteria was related to histological abnormality with high numbers of bacteria in the 7 patients with partial or subtotal villous atrophy. Tetracycline (250 mg/6 hr, p.o., for 4 weeks) either considerably reduced or erradicated the counts of enterobacteria within the mucosa. This reduction was accompanied by uniform improvement in mucosal appearance. One patient, although exhibiting initial improvement, failed to respond successfully to this therapy. Since clinical and biochemical improvement occurred on treatment with tetracycline when enterobacteria were eliminated from the mucosa, it is felt that these organisms may be responsible for persisting jejunal abnormalities in tropical sprue.

0482 SEASONAL OCCURRENCE OF OVERT AND SUBCLINICAL TROPICAL MALABSORPTION IN PUERTO RICO. *(E.)* Klipstein, F. A.; Corcino, J. J. (Trop. Malabsorpt. Unit, Univ. Rochester, N.Y.). *Am. J. Trop. Med. Hyg.* 23(6):189-196, 1974.

Among 96 rural residents of Puerto Rico who were evaluated in groups of 10-15/month from July through February, the prevalence of malabsorption of single and multiple substances and of severe jejunal morphologic abnormalities was significantly higher during the months of December through February than during the preceding 5 months. Of 27 persons hospitalized with overt tropical sprue during the course of the year, 14 (61%) also experienced the onset of their gastrointestinal symptoms during this 3-month winter period. Of 7 individuals who became symptomatic while living in the tropics, moved to New York City, and were subsequently hospitalized for tropical sprue, 6 (87%) noted the onset of symptoms during the period of December through March. In contrast, no such seasonal variation was evident among 16 expatriates from the West Indies who developed their initial symptoms of sprue while resident in New York City. Enterotoxigenic coliform bacteria, principally *Klebsiella pneumoniae* and *Enterobacter cloacae* were cultivated from the jejunum in 10 of 11 persons with tropical sprue who were investigated throughout the year. These organisms were also found in 2 of 3 rural residents examined in December through February, but in none of 6 other persons studied during the preceding 4 months. These observations point toward an environmental factor present in Puerto Rico during the period of December through February which is associated with a high prevalence of intestinal abnormalities in the general population, the onset of symptoms in persons with tropical sprue, and colonization of the small intestine by enterotoxigenic bacteria. The only environmental factor as yet identified was a change in dietary intake of fat commencing during early December in keeping with the month-long Christmas season in Puerto Rico. At this time the intake of pork and foodstuffs deep-fried in pork drippings increased markedly. The products are rich in unsaturated long chain fatty acids, principally oleic and linoleic acid. The presence of long-chain unsaturated fatty acids may contribute to changes in the bacterial population by altering the intestinal milieu to one unfavorable to the growth of bacteria normally resident there, with subsequent colonization by coliform bacteria.

0483 DRUG-INDUCED MALABSORPTION OF VITAMIN B_{12}. VI. MALABSORPTION OF VITAMIN B_{12} DURING TREATMENT WITH PHENFORMIN. *(E.)* Jounela, A. J.; Pirttiaho, H.; Palva, I. P. (Dep. Med., Univ. Onlu, Finland). *Acta Med. Scand.* 196(4):267-269, 1974.

The effect of long-term phenformin therapy on vitamin B_{12} absorption was studied in 25 diabetic patients (mean age 63.7 yr). The duration of diabetes in these patients was 7.1 yr and the length of drug therapy was 4.4 yr. Controls (11 additional patients) were treated with either chlorpropamide or tolbutamide. Diet was controlled in all patients. No patient was anemic. Of the 25 phenformin patients, 10 (40%) showed abnormally low excretion of radioactive vitamin B_{12} (4.4%) when studied without intrinsic factor. Control patients excreted 17.4%. Of the 10 phenformin patients with B_{12} malabsorption, 4 were unable to continue the study. Of the remaining 6, 5 again showed low excretion of labeled vitamin B_{12} when the test was repeated with intrinsic factor. Absorption of vitamin B_{12} was normalized in 4 of the 5 patients after discontinuation of phenformin treatment. In one of them this change was evident after an 8-day pause; in the others it required 2-8 weeks. The malabsorption noted in this study did not correlate with the age of the patients, nor with the duration of their diabetes, nor with the duration of success of its treatment with phenformin.

0484 HISTOENZYMOLOGICAL STUDY OF THE INTESTINAL MUCOSA IN FIVE CASES OF WHIPPLE'S DISEASE. CHANGES DURING ANTIBIOTIC THERAPY. *(Fr.)* Ganter, P.; Marche, C.; Delesque, M.; Laumonier, R.; Metayer, J.; Cerf, M. (U.E.R. des Cordeliers, Paris, France). *Ann. Anat. Pathol.* 19(1):97-116, 1974.

Fragments of the intestinal mucosa were biopsied before treatment was begun in 2 cases and during treatment in 4 cases of Whipple's disease. Histological, ultrastructural, and histoenzymological studies, involving 21 hydrolases and oxidoreductases, were made for the enterocytes of the villi, the epithelium of the crypts, and the pathologic histiocytes of the lamina propria. The periodic acid-Schiff-positive macrophages of the intestinal epithelium showed abnormally high acid hydrolase activity (nonspecific acid phosphatase and β-D-glucuronidase). This finding is characteristic of Whipple's disease and subsides slowly with treatment. The activities of cytochrome oxidase and glucose-6-phosphatase in mucosal lamina propria macrophages were also elevated in 1 case. In 2 or 3 cases the phosphatase activity of the striated plateau was greatly diminished; decreases in the activities of nonspecific alkaline phosphomonoesterase, ATPase, 5'-nucleotidase, and thiamine pyrophosphatase may be implicated. It is concluded that the decrease in their activities accounts for the severe malabsorption. This abnormality disappears rapidly with treatment. Glucose-6-phosphatase, normally very active in the intestinal epithelium, was totally absent in 2 cases, and its activity varied in a 3rd case. This suggests disruption of the sodium pump, but the mechanism of the change is not known. This change was the slowest to respond to treatment. In one case, the activity of a number of other epithelial enzymes, particularly the dehydrogenases, was reduced.

0485 ENTEROKINASE ACTIVITY OF NORMAL AND FLAT DUODENAL MUCOSA. *(E.)* Rutgeerts, L.; Tytgat, G.; Mainguet, P.; Eggermont, E. (Dep. Pediatr., Univ. Louvain, Belgium). *Acta Gastroenterol. Belg.* 36(9):449-455, 1973.

The distribution of enterokinase along the small intestine of human adults with normal and flat intestinal mucosa was studied. A control group consisting of 10 male and 10 female subjects (17-51 yr old) had a morphologically normal intestinal mucosa and were free from gastrointestinal diseases. Eight male and 9 female patients (29-69 yr old) with malabsorption and a flat upper intestinal mucosa were studied before treatment; 4 male and 6 female patients (28-56 yr old) who had been treated with a gluten-free diet for at least 4 months were also studied. Intestinal biopsies were taken with a hydraulic biopsy tube. Two specimens, one for histological examination and one for enzyme assays, were obtained at 4 different levels of the duodenum. Duodenal juice was obtained in 14 control subjects and in 9 untreated patients. All enzyme studies were carried out immediately after homogenization or dilution to preserve enterokinase activity. Mucosal enterokinase activity was restricted almost exclusively to the duodenum and decreased from the proximal to the distal portion. Its distribution within the mucosa is confined to cells of the villous tips. In flat intestinal mucosa, enterokinase is less decreased than alkaline phosphatase or sucrase. Although most of the individual values fell within the normal range, the mean enterokinase activity in flat mucosa was significantly different from the mean value of normal mucosa. In patients with a flat intestinal mucosa, enterokinase activity of the duodenal juice was normal. Secondary enterokinase deficiency, therefore, seems not to be a prevalent problem in celiac disease.

0486 STUDY OF URINARY EXCRETION OF INDICAN IN PATIENTS SUBJECTED TO GASTRIC SURGERY. *(Sp.)* Rodrigo Gomez, J. M.; Aparisi Quereda, L.; Serra Desfilis, M. A.; Guix Garcia, J.; Tomas Ridocci, M.; Castellanos Escrig, G.; Parrilla Paricio, P.; Garcia-Conde Gomez, F. J. (Fac. Med., Valencia, Spain). *Rev. Esp. Enferm. Apar. Dig.* 42(3):311-322, 1974.

Urinary indican excretion was measured spectrophotometrically on 24-hr urine specimens from 78 patients, aged 25-65 yr, who had undergone the Billroth I procedure (22 cases), Billroth II procedure and vagotomy (35 cases), or truncal vagotomy and Heinicke-Mikulicz pyloroplasty (21 cases) 3 months to 5 yr before. Controls consisted of 37 normal subjects and patients with no evidence of gastrointestinal disease. All subjects received diets containing less than 80-90 g/day protein at this time. Fat determinations were performed on 24-hr stool specimens, taken on 3 consecutive days, from 36 of the patients who had undergone gastric surgery, and mean values for fecal fat excretion were calculated. A Schmidt-type diet was given for 5 days before fat determinations were made. Urinary indican excretion was significantly higher among patients who had undergone Billroth I and II procedures than among controls, while no difference was found between urinary indican excretion in controls and in patients who had been subjected to vagotomy and pyloroplasty. A significant correlation was found between urinary indican and fecal fat excretion. Bacterial overgrowth in the afferent loop might account for elevated urinary indican excretion in patients who had undergone the Billroth II procedure, while high indican values could be caused by intestinal bacterial proliferation secondary to impairment of pyloric function and decreased gastric secretion after the Billroth I procedure. In patients who had undergone vagotomy and pyloroplasty, steatorrhea is secondary to decreased pancreatic secretion and biliary dyskinesia caused by vagotomy, but this apparently does not produce bacterial overgrowth resulting in bile salt deconjugation and fat malabsorption as appears to occur in patients with Billroth II gastrectomies. Determinations of urinary indican excretion in patients who have undergone gastric surgery makes it possible to determine indirectly the extent of bacterial proliferation in the intestine which is secondary, in many cases, to blind-loop syndrome or intestinal stenosis. The early diagnosis of these syndromes makes it possible to prevent the development of severe metabolic sequelae of gastric surgery.

0487 WHEN TO THINK OF CELIAC DISEASE. THE CLASSICAL FEATURES OF GLUTEN SENSITIVE ENTEROPATHY ARE OFTEN ABSENT. *(E.)* Brown, M. R.; Lillibridge, C. B. (Univ. Rochester Sch. Med., N.Y.). *Clin. Pediatr.* 14(1):76-82, 1975.

0488 ILEAL FUNCTION IN PATIENTS WITH COELIAC DISEASE. *(E.)* Silk, D. B. A.; Kumar, P. J.; Clark, M. L.; Dawson, A. M. (St. Bartholomew's Hosp., London, England). *Gut* 15(10):827-828, 1974.

0489 PRIMARY AMENORRHEA IN CELIAC DISEASE. TWO CASES. *(Fr.)* Netter, A. P.; Cahen, G. C. (Necker Hosp., Paris, France). *J. Obstet. Gynaecol. Biol. Repr.* 3(4):521-528, 1974.

0490 THE NATURE OF GLIADIN TOXICITY IN COELIAC DISEASE. *(E.)* Phelan, J. J. (Dep. Biochem., Univ. Coll., Galway, Ireland). *Biochem. Soc. Trans.* 2(6):1368-1370, 1974.

0491 COW'S MILK PROTEIN INTOLERANCE ASSOCIATED WITH A CHRONIC MALABSORPTION SYNDROME AND SEVERE INTESTINAL LESIONS SIMULATING CELIAC DISEASE. *(Fr.)* Deleze, G.; Nussle, D.; Megevand, A.; Gautier, E. (no affil.). *Helv. Paediatr. Acta* 33(suppl):24, 1974.

0492 VITAMIN B_{12} ABSORPTION IN INTESTINAL DISEASES. (COELIAC DISEASE, DERMATITIS HERPETIFORMIS, ULCERATIVE COLITIS, CROHN'S DISEASE, JEJUNOILEAL SHUNTING). *(E.)* Fausa, O. (Rikshosp., Oslo, Norway). *Scand. J. Gastroenterol.* [*Suppl.*] 9(29):75-79, 1974.

0493 MALABSORPTION OF VITAMIN B_{12} IN OBESE PATIENTS TREATED WITH JEJUNOILEAL SHUNT. *(E.)* Hippe, E.; Juhl, E.; Bruusgaard, A.; Korner, B.; Quaade, F.; Baden, H. (Bispebjerg Hosp., Copenhagen, Denmark). *Scand. J. Gastroenterol.* [*Suppl.*] 9(29): 81-83, 1974.

0494 VITAMIN B_{12} ABSORPTION AFTER RESECTION OF ILEUM IN CHILDHOOD. *(E.)* Valman, H. B.; Roberts, P. D. (Queen Elizabeth Hosp. Child., London, England). *Arch. Dis. Child.* 49(12):932-935, 1974.

0495 THE ABSORPTION OF VITAMIN B_{12} IN THE BLIND-LOOP SYNDROME. *(E.)* Schjonsby, H. (Med. Dep. A, Univ. Bergen, Norway). *Scand. J. Gastroenterol.* [*Suppl.*] 9(29):65-70, 1974.

0496 DIAGNOSIS OF BLIND LOOP SYNDROME. *(Rus.)* Tamm, A. O.; Mikhlisaar, M. M. (Cent. Med. Res. Lab., Tartu, Univ., USSR). *Ter. Arkh.* 46:86-91, 1974.

0497 ABSORPTION OF SLOW-RELEASE IRON AND EFFECTS OF ASCORBIC ACID IN NORMAL SUBJECTS AND AFTER PARTIAL GASTRECTOMY. *(E.)* Baird, I. M.; Walters, R. L.; Sutton, D. R. (West Middlesex Hosp., England). *Br. Med. J.* 4(5943):505-508, 1974.

0498 WHIPPLE'S DISEASE: ETIOPATHOGENESIS, TREATMENT, DIAGNOSIS, AND CLINICAL COURSE. CASE REPORT AND REVIEW OF THE WORLD LITERATURE. *(E.)* Miksche, L. W.; Blumcke, S.; Fritsche, D.; Kuchemann, K.; Schuler, H. W.; Grozinger, K. H. (Community Hosp., Leverkusen, Germany). *Acta Hepatogastroenterol.* 21(4):307-326, 1974.

0499 WHIPPLE'S DISEASE MANIFESTED BY ARTHRITIS. *(Fr.)* Ghozlan, R.; Rampon, S.; Ryckewaert, A. (Lariboisiere Hosp., Paris, France). *Nouv. Presse Med.* 3(31):1935-1937, 1974.

0500 STUDIES ON TRYPTOPHAN CATABOLISM IN ACRODERMATITIS ENTEROPATHICA. *(E.)* Stachow, A.; Papuzinski, M.; Zalewski, T.; Skiendzielewska, A. (Warsaw Med. Sch., Poland). *Acta Derm. Venereol. (Stockh.)* 54(6):457-463, 1974.

0501 ACRODERMATITIS ENTEROPATHICA TREATED BY ZINC. *(E.)* Portnoy, B.; Molokhia, M. (Skin Hosp., Manchester, England). *Br. J. Dermatol.* 91(6):701-703, 1974.

See also, 0030, 0295, 0342, 0357, 0401, 0473, 0476, 0536, 0537, 0568, 0621, 0650, 0740, 0750.

LARGE INTESTINE

0502 COMBINATION OF CARCINOEMBRYONIC ANTIGEN AND GAMMA GLUTAMYL TRANSPEPTIDASE IN THE STUDY OF THE EVOLUTION OF COLORECTAL CANCER. *(E.)* Steele, L.; Cooper, E. H.; Mackay, A. M.; Losowsky, M. S.; Goligher, J. C. (Dep. Exp. Pathol., Cancer Res., Univ. Leeds, England). *Br. J. Cancer* 30(4):319-324, 1974.

Combinations of plasma carcinoembryonic antigen (CEA) values and serum γ-glutamyl transpeptidase activities were used to detect metastatic colorectal cancer and distinguish the sites of the metastases. Plasma CEA and serum γ-glutamyl transpeptidase levels were measured in 60 patients with primary tumors of the colon or rectum and in 49 with metastatic colorectal cancer, in 17 of whom the primary tumor was also present. Similar measurements were made in 35 patients with histologically proven acute hepatitis, chronic hepatitis or cirrhosis. The normal value for CEA was 12.9 ng/ml. Normal glutamyl transpeptidase activities were 13.9 IU/liter. There was considerable overlap in CEA values between patients with colorectal cancer and those with non-malignant hepatic disease. CEA was plotted against the serum γ-glutamyl transpeptidase activities in patients presenting with primary colorectal cancers. A discriminant level of CEA of 100 ng/ml and a discriminant level of γ-glutamyl transpeptidase of 45 IU/liter were arbitrarily adopted. Of 43 tumors without evidence of spread outside the bowel and its local lymph nodes, or distant metastasis, 37 fell within the area bounded by these discriminants. Of the 17 tumors with hepatic metastases or local extension involving the peritoneum or pelvis, 14 had values on or outside the area. From 6 months to 8 yr after being clinically tumor free, 20 patients developed liver metastases. Using CEA values alone and a discriminant value of 100 ng/ml, only 3 of these 20 would not have been detected. Using the combination of parameters, all 20 would have been detected, and only 5 of 12 patients with local extension in the abdomen would have been false-positive for hepatic metastases. Using both these tests, clinically inapparent tumor in the liver can be detected before laparotomy or during follow-up. The serum γ-glutamyl transpeptidase activity indicates that the liver is diseased and the CEA value appears to discriminate between hepatomegaly due to metastatic cancer or benign hepatic disease.

0503 THE TREATMENT OF PEDUNCULATED ADENOMATOUS COLORECTAL POLYPS WITH FOCAL CANCER. *(E.)*

Shatney, C. H.; Lober, P. H.; Gilbertsen, V. A.; Sonin, H. (Univ. Minnesota Health Sci. Cent., Minneapolis). *Surg. Gynecol. Obstet.* 139(6):845-850, 1974.

In 59 patients in whom the sole colorectal pathologic lesion was a pedunculated adenomatous polyp, 31 with *in situ* carcinoma were compared with 28 who had invasive carcinoma confined to the head of the tumor. In the 1st group (20 men 11 women, mean age 65 yr), 87% had the tumor in the rectosigmoid colon. Local excision was performed in 20 patients and extensive surgery in 11, with 1 death due to peritonitis following major surgery for removal of an *in situ* lesion. At the time of reporting 22 are alive and free of cancer of the colon. Of the 20 who underwent local surgery (2 by colonoscopic polypectomy) 15 remained alive and free of cancer. Of the 5 patients who died since surgery 4 lived for 5 or more years, and no evidence of cancer was found at the time of death. In the 2nd group, 17 patients (9 men 8 women, mean age 60 yr) had malignant changes limited to the distal portion of the head of the polyp and in 11 patients (8 men 3 women, mean age 64 yr) the carcinoma extended to the neck of the polyp. Diagnosis was established by barium enema examination in 15 cases and by proctoscopy in 13. No metastases were found in 14 patients who underwent laparotomy out of the group of 17. A metastasis in a pericolic lymph node was found in 1 of 9 patients who were operated for adenomatous polyps with carcinoma extending to the neck of the tumor. Of the group of 28 patients, 19 are alive and free of cancer of the colon (17 for at least 5 years post-treatment). Eight patients had only treatment of the lesions (colonic polypectomy in one case), and all are alive and free of disease, 5 of them for at least 5 years. It is concluded that the treatment of focally malignant pedunculated adenomatous polyps of the colon and rectum by colonoscopic removal is ideal when the malignancy does not extend further than the head of the tumor. Contraindications to local treatment would be the presence of lymphatic invasion, a highly undifferentiated cancer, and extremely short pedicle or extension of the malignancy to the neck of the polyp. Radical surgery is the treatment of choice for pedunculated adenoma with cancer extension to the base of the pedicle and for polypoid carcinoma.

0504 BLOOD MURAMIDASE ACTIVITY IN COLORECTAL CANCER. *(E.)*

Cooper, E. H.; Turner, R.; Steele, L.; Goligher, J. C. (Dep. Exp. Pathol. Cancer Res., Univ. Leeds, England). *Brit. Med. J.* 3(5932):662-664, 1974.

Serum muramidase levels were measured in 166 tumor-free patients after resection of a colorectal cancer, 60 patients before resection of a localized primary adenocarcinoma of the colon or rectum, 39 patients with evidence of hepatic metastases, 29 patients with recurrence or local residual tumor spread in the pelvis, and 172 controls. Muramidase levels over 10 μg/ml were detected in 10-19% of the tumor-bearing patients, in 8.2% of the tumor free patients, and in only 1.7% of the controls (normal level 6.68 μg/ml). Repeated observations over periods of 3-12 weeks of 122 tumor-free patients and 26 patients with clinically detectable metastases or biochemical patterns suggesting metastases revealed 6.6% of the former group with muramidase levels over 10 μg/ml as compared to 38.3% with over 10 μg/ml muramidase for the latter group. There was no correlation between serum creatinine and muramidase levels in 35 patients chosen at random from those with raised muramidase levels. The long-term follow-ups indicated that raised muramidase levels may occur as a transient phenomenon in recurrent or metastatic disease. The reason for raised muramidase activity in some patients with cancer is not clear, though one possibility is that the increased activity is a reflection of a host-tumor reaction, perhaps a stimulation of the reticuloendothelial system.

0505 ACTION OF DIFFERENT BRAN PREPARATIONS ON COLONIC FUNCTION. *(E.)*

Kirwan, W. O.; Smith, A. N.; McConnell, A. A.; Mitchell, W. D.; Eastwood, M. A. (Dep. Clin. Surg., Univ. Edinburgh, Scotland). *Brit. Med. J.* 4(5938):187-189, 1974.

The effectiveness of fine and coarse bran preparations in lowering intraluminal pressure and decreasing transit time in patients with constipation and diverticular disease was investigated. Fine bran

(10 g twice daily for 4 weeks) was given to 5 patients, 3 with radiologically proven diverticular disease, and 2 with constipation. Coarse bran was given in the same dosage to 9 patients with diverticular disease. Basal, post-food, and post-neostigmine motility indices for the coarse-bran patients decreased from 892.8 to 648.7, 1513.2 to 446.1, and 2120.0 to 1216.8, resp. Gastrointestinal transit time was lowered from 93.4 to 57.9 hr. Basal, post-food, and post-neostigmine motility indices for the fine-bran patients increased from 1181 to 1269, 1429 to 2534, and 4075 to 4661, resp. Gastrointestinal transit time fell from 98 to 86 hr. In 4 patients first given fine bran and then changed to coarse bran, the mean transit time after 4 weeks of coarse bran was lowered from 96 hr to 51 hr. Basal, post-food, and post-neostigmine motility indices in this group changed froom 1202 to 303, 2369 to 1459, and 4726 to 2746. The greatest effect of coarse bran in reducing intraluminal pressure and decreasing transit time appears to be due to its greater water-holding capacity which is a function of particle size, thus making it preferable for the treatment of colonic disorders.

0506 EXPERIENCE WITH A CHOLINESTERASE HISTOCHEMICAL TECHNIQUE FOR RECTAL SUCTION BIOPSIES IN THE DIAGNOSIS OF HIRSCHSPRUNG'S DISEASE. *(E.)* Trigg, P. H.; Belin, R.; Haberkorn, S.; Long, W. J.; Nixon, H. H.; Plaschkes, J.; Spitz, L.; Willital, G. H. (Hosp. Sick Child., London, England). *J. Clin. Pathol.* 27(3):207-213, 1974.

A cholinesterase histochemical technique was applied to rectal suction biopsies in an attempt to make the submucosal nervous tissue more conspicuous and also to evaluate the significance of mucosal cholinesterase activity in the diagnosis of Hirschsprung's disease. A total of 160 biopsies were taken from 101 patients (aged 2 days to 17 yr) and processed for cholinesterases. All patients had presented with a clinical picture suggestive of Hirschsprung's disease which was ultimately confirmed by definitive surgery in 33 and excluded in the remainder. The biopsy was immediately spread submucosa-down onto a small block of animal spleen or liver and quick frozen in hexane. The sample was cut at 15 μ in a plane perpendicular to the flattened submucosal surface. Slides were air-dried for a few min, immersed for 30 sec in 10% neutral formalin at room temperature and washed in distilled water. They were incubated for 3 hr at 37 C using a medium described by Karnovsky and Roots, and an acetate buffer at pH 6.0 and s-acetylthiocholine iodide as substrate. Inhibitors were not routinely used, so the histochemical reaction presumably demonstrated both true (acetyl-) and pseudocholinesterase activity. After rinsing in distilled water, slides were counterstained in Ehrlich's hematoxylin to show the nuclei, differentiated in 1% acid alcohol, blued in running tap water, dehydrated, cleared in xylol and mounted in Canada balsam. The end product of the histochemical reaction is a finely granular and highly refractile deposit of red-brown copper ferrocyanide. Localization was good. The method proved at least as reliable as experienced assessment of paraffin hematoxylin-eosin sections, and appeared to offer the advantages of reduced scanning fatigue, and superior demonstration of the increased cholinesterase-positive nerves in Hirschsprung's disease. It was not possible to base a diagnosis on mucosal cholinesterase activity.

0507 MITOTIC ACTIVITY OF EPITHELIAL CELLS IN IN WOUNDED RECTAL MUCOUS MEMBRANE. *(E.)* Reeve, D. R. E. (R. Coll. Surg. England, London). *J. Anat.* 118(2):231-239, 1974.

Patterns of mitotic activity in the epithelial cells of the rectal mucous membrane at a wound margin were studied using female Wistar rats. Ulcers were made by excising small portions of the rectal mucous membrane. Within 24 hr the mitotic number had increased 2-fold over controls and peaked at day 2, with a mitotic number 5 times controls. The level fell rapidly the next day, but rose to a smaller peak of activity on day 4. During the following 3 days the levels fell to pre-peak values and remained constant. A third large peak appeared on the 18th or 19th day, falling by day 20. A 4th, smaller peak occurred on day 24 which also dropped a day later. Autoradiography in a further series of animals confirmed that there is after wounding an obvious increase in mitotic activity which does not occur as a simple rise and fall but as a series of peaks occurring at reasonably constant times after wounding (2, 11-12, 18-19, and 22-24 days). There was also an overall rise in the level of mitotic activity up to day 14, after which the level fell to almost normal values. This peak and trough pattern suggests that one effect of injury is to induce a temporary synchrony in the cell cycle so that cell division occurs *en masse*. Although mitotic cells are usually confined to the basal parts of the colonic glands, as the mitotic number approached a peak, mitoses were found in the middle parts of the glands as well.

0508 PERFORATIVE CARCINOMA OF COLON AND RECTUM. *(E.)* Welch, J. P.; Donaldson, G. A. (Massachusetts Gen. Hosp., Boston). *Ann. Surg.* 180(5):734-740, 1974.

0509 CARCINOMA OF THE RECTUM. *(Gr.)* Xanthakis, D. S. (no affil.). *Iatriki* 24(1):19-30, 1973.

0510 CARCINOMA OF THE COLON, RECTUM, AND ANAL CANAL IN YOUNG PATIENTS. *(E.)* Recalde, M.; Holyoke, E. D.; Elias, E. G. (Roswell Park Mem. Inst., Buffalo, N.Y.). *Surg. Gynecol. Obstet.* 139(6):909-913, 1974.

0511 100% OXYGEN INHALATION AND 5-FLUOROURACIL (NSC-19893) THERAPY FOR LARGE BOWEL CARCINOMA. *(E.)* Moertel, C. G.; Schutt, A. J.; Reitemeier, R. J.; Hahn, R. G. (Mayo Clin., Rochester, Minn.). *Cancer Chemother. Rep.* 58(6):951-952, 1974.

0512 STEROID NUCLEAR DEHYDROGENATION AND COLON CANCER. *(E.)* Hill, M. J. (Cent. Public Health Lab., London, England). *Am. J. Clin. Nutr.* 27(12):1475-1480, 1974.

0513 ADENOACANTHOMA OF THE APPENDIX. *(E.)* Schulte, W. J.; Pintar, K.; Schmahl, T. (Wood VA Cent., Milwaukee, Wis.). *J. Surg. Oncol.* 6(2):93-96, 1974.

0514 ADENOCARCINOMA OF THE VERMIFORM APPENDIX. *(E.)* Forsgren, L.; Molin, K.; Rieger, A. (Danderyd Hosp., Sweden). *Acta Chir. Scand.* 140(6): 486-490, 1974.

0515 CANCER RISK FOLLOWING APPENDECTOMY. *(Ger.)* Grosse, H. (Am Sund Reg. Hosp., Stralsund, Germany). *Arch. Geschwulstforsch.* 43(4):358-363, 1974.

0516 COLONIC ISCHEMIA AFTER PROSTHETIC REPLACEMENT OF THE ABDOMINAL AORTA AND OTHER FORMS OF ISCHEMIC COLITIS. *(Ger.)* Rausis, C.; Mirkovitch, V.; Robinson, J. W. L.; Roenspiess, U.; Saegesser, F. (Surg. Clin. A, Univ. Lausanne, Switzerland). *Praxis* 63(18):545-549, 1974.

0517 ISCHEMIC COLITIS: REVISION OF ITS ANATOMICAL AND CLINICAL CLASSIFICATION WITH REGARD TO ONE CASE OF COLONIC VASCULITIS. *(Sp.)* Lain Martinez, P.; de Villalobos, E.; Nadal Capara, J.; Ramirez Guedes, Guedes, J.; Oliva, H. (Jimenez Dias Found., Madrid, Spain). *Rev. Clin. Esp.* 129(6):561-566, 1973.

0518 LAXATIVE ABUSE. *(E.)* Cummings, J. H. (Cent. Middlesex Hosp., London, England). *Gut* 15(9):758-766, 1974.

0519 PNEUMATOSIS CYSTOIDES INTESTINALIS. A CASE DIAGNOSED BY MEANS OF RECTOSCOPY, WITH BIOPSY AND A SUMMARY OF THE DANISH OBSERVATIONS. *(E.)* Kristensen, J. K. (Cty. Hosp., Braedstrup, Denmark). *Acta Chir. Scand.* 140(6):501-504, 1974.

0520 THE HIGH FIBRE DIET IN THE TREATMENT OF DIVERTICULAR DISEASE OF THE COLON. *(E.)* Painter, N. S. (Manor House Hosp., London, England). *Postgrad. Med. J.* 50(588):629-635, 1974.

0521 A TRANSINTESTINAL GUIDE FOR FIBEROPTIC COLONOSCOPY IN DIFFICULT CASES. *(E.)* Rogers, B. H. G. (Henrotin Hosp., Chicago, Ill.). *Gastrointest. Endosc.* 21(2):62-65, 1974.

0522 SIGNIFICANCE OF A NEW THERAPEUTIC DRUG, DIOSMINE, IN PROCTOLOGY. *(Fr.)* Peeters, J. P. (Brugmann Univ. Hosp., Brussels, Belgium). *Brux. Med.* 53(10):591-594, 1973.

See also, 0291, 0308, 0334, 0342, 0358, 0359, 0360, 0452, 0455, 0476, 0546, 0548, 0736, 0754, 0755, 0790, 0791, 0793.

LARGE INTESTINE

Ulcerative Colitis

0523 NECROTIZING VASCULITIS AND ULCERATIVE COLITIS. *(E.)* Wackers, F. J. T.; Tytgat, G. N.; Vreeken, J. (Dep. Intern. Med., Univ. Amsterdam, Netherlands). *Br. Med. J.* 4(5936):83-84, 1974.

A 26-yr-old man was treated with coumarin for 6 months because of migrating thrombophlebitis. On the second day after stopping the coumarin, the patient became feverish and developed painful bluish spots on his thighs; some of these disappeared spontaneously, but two days later a more extensive bluish area appeared in the inner aspect of the left thigh and this last lesion developed a central hemorrhagic necrosis of the skin. Coumarin was again prescribed, but was stopped after 3 days because of hematuria and bloody stools. Laboratory tests showed the erythrocyte sedimentation rate was 73 mm in the first hour, hemoglobin was 9 g/100 ml and WBC 20,000/mm^3. Fibrin degradation products were increased and Thrombotest time (Owren) was prolonged. All other coagulation values were normal. Benzidine test for occult blood in the feces was strongly positive. Arthritic, polyarthritic and purpuric lesions apparently vasculitic in origin developed in various locations and it was felt that the patient was suffering from a systemic or underlying disease. Careful questioning disclosed several episodes of diarrhea in previous years with blood in the stools during the last 2 months of coumarin treatment. A sigmoidoscopy was performed. The bowel mucosa was edematous and swollen, covered by thick mucopurulent exudate and showing numerous hemorrhagic spots and tiny superficial erosions, the picture strongly suggestive of severe ulcerative colitis. Biopsy specimens confirmed this diagnosis. The patient was initially treated with 3 g sulphasalazine, 50 mg prednisone and a short course of ampicillin. I.v. heparin was administered for 10 days. The areas of skin necrosis were debrided and healed by granulation or with the help of skin grafts. A sigmoidoscopy performed 1 1/2 months after treatment revealed an almost normal mucosa. The prednisone was reduced to 15 mg/day. On follow-up 9 months later the patient was found in excellent condition clinically and by sigmoidoscopy.

0524 ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY IN THE DIAGNOSIS OF JAUNDICE ASSOCIATED WITH ULCERATIVE COLITIS. *(E.)* Elias, E.; Summerfield, J. A.; Dick, R.; Sherlock, S. (R. Free Hosp., London, England). *Gastroenterology* 67(5): 907-911, 1974.

Endoscopic retrograde cholangiopancreatography was performed in 4 jaundiced ulcerative colitis patients. In a 30-yr-old male, a liver biopsy 4 yr earlier had been thought to show primary biliary cirrhosis and a recent attempt at percutaneous transhepatic cholangiography had failed. Retrograde cholangiopancreatography revealed a short extremely irregular stricture high in the common bile duct. The normal caliber and outline of the duct below the stricture favored diagnosis of cholangiocarcinoma, rather than sclerosing cholangitis. The shortness of the segment and the severity of obstruction indicated immediate surgery and carcinoma was successfully resected. In a 35-yr-old woman and a 21-yr-old man, endoscopic retrograde cholangiopancreatography revealed changes typical of sclerosing cholangitis, including multiple strictures with beading of ducts between the narrowed segments, and involvement of both the intrahepatic and extrahepatic systems. In both these cases surgery was averted. In a 16-yr-old jaundiced male, the depth of icterus made any attempt at oral or i.v. cholangiography impossible, and a clotting disorder precluded either liver biopsy or percutaneous cholangiography. A retrograde cholangiogram revealed a normal biliary tree, excluding extrahepatic obstruction. Liver biopsy just prior to discharge showed changes of a long-standing, probably viral, hepatitis. Endoscopic retrograde cholangiopancreatography is of particular value in jaundiced patients with ulcerative colitis, not only in demonstrating extrahepatic obstruction when present, but also in showing whether surgical intervention is likely to benefit the patient. Thus patients with features of cholestasis may be spared liver biopsy, unsuccessful percutaneous transhepatic cholangiography, and hazardous biliary surgery.

0525 HYPOSPLENISM AND ULCERATIVE COLITIS. *(E.)* Ardeman, S.; Bevan, G. (Edgware Gen. Hosp., England). *Lancet* 2(7880):588, 1974.

PANCREAS

0526 NONFUNCTIONING NONCHROMAFFIN PARAGANGLIOMA OF THE PANCREAS. *(E.)* Cope, C.; Greenberg, S. H.; Vidal, J. J.; Cohen, E. A. (Albert Einstein Med. Cent., Philadelphia, Pa.). *Arch. Surg.* 109(3): 440-442, 1974.

Barium study of the gastrointestinal tract of a 72-yr-old woman revealed a pancreatic mass that caused elevation and widening of the duodenal loop. The same symptomless tumor had been noted 2 yr earlier. Angiography showed a well-rounded paraganglioma (11 x 14 cm), the blood supply of which derived equally from the pancreaticoduodenal and omental arteries and branches of the right colic artery from the superior mesenteric artery. The tumor and a small portion of adjacent pancreas were removed. Microscopical examination indicated a very cellular, well-encapsulated neoplasm. In the area traversing the transition from pancreas to neoplasm, there was some invasion of the capsule as well as invasion of large vascular sinuses by neoplasm. The tumor did not stain with chrome salts or glutaraldehyde and was diagnosed as a juxtapancreatic nonchromaffin paraganglioma. This is only the 4th reported case of such a tumor associated with the pancreas. The patient's chance of cure is excellent due to her age and the lack of satellite tumors.

0527 PANCREATIC DISEASE. *(E.)* Kafka, E. C.; Kalser, M. H. (Univ. Miami Sch. Med., Fla.). *Postgrad. Med.* 57(1):140-152, 1975.

0528 THE DIAGNOSIS OF PANCREATIC CARCINOMA. *(Ger.)* Loffler, A.; Stadelmann, O.; Miederer, S. E.; Sobbe, A. (Med. Polyclin., Univ. Bonn, Germany). *Dtsch. Med. Wochenschr.* 99(40):1976-1983, 1974.

0529 REPLACEMENT OF PORTAL VEIN DURING PANCREATECTOMY FOR CARCINOMA. *(E.)* Norton, L.; Eiseman, B. (Denver Gen. Hosp., Colo.). *Surgery* 77(2): 280-284, 1975.

0530 PANCREATICO-DUODENAL RESECTION AND BY-PASS OPERATION IN PATIENTS WITH CARCINOMA OF THE HEAD OF THE PANCREAS, AMPULLA, AND DISTAL END OF THE COMMON DUCT. *(E.)* Hertzberg, J. (Ulleval Hosp., Oslo, Norway). *Acta Chir. Scand.* 140(7):523-527, 1974.

0531 SPONTANEOUS RUPTURE OF A PANCREATIC PSEUDOCYST INTO THE COLON. *(E.)* Barnardo, D. E.; Grogono, J. L.; Parks, A. G. (London Hosp., England). *Am. J. Dig. Dis.* 19(12):1165-1167, 1974.

0532 PANCREATIC FISTULAS. *(Ger.)* Mangold, G. (Surg. Clin., Univ. Mainz, Germany). *Langenbecks Arch. Chir.* 337:127-130, 1974.

0533 PANCREAS INJURIES IN BLUNT ABDOMINAL TRAUMA. EXPERIENCE WITH DIAGNOSIS AND TREATMENT IN 20 PATIENTS. *(E.)* Cardozo, M. L. (Surg. Clin., State Univ., Groningen, Netherlands). *Arch. Chir. Neerl.* 26(4):289-297, 1974.

0534 DISORDERS IN PANCREATIC FUNCTION OF TOXIC CHEMICAL ORIGIN. *(Rus.)* Kleiner, A. I.; Vasilenko, N. M.; Sonkin, I. S.; Ostrovskaia, I. S.; Iashina, L. N.; Liss, N. L. (Inst. Ind. Hyg. Occup. Dis., Kharkov, USSR). *Gig. Tr. Prof. Zabol.* (10):15-18, 1974.

0535 INSULAR HYPERPLASIA AND HYPOGLYCAEMIA: A REVIEW OF THE PROBLEM. *(E.)* Carboni, M.; Patrassi, N. (Surg. Clin. II, Univ. Rome, Italy). *Rend. Gastroenterol.* 5(3):235-236, 1973.

0536 ABSORPTION OF VITAMIN B_{12} IN PANCREATIC INSUFFICIENCY. *(E.)* von der Lippe, G. (Med. Dep. A, Univ. Bergen, Norway). *Scand. J. Gastroenterol.* [*Suppl.*] 9(29):71-73, 1974.

0537 VITAMIN B_{12} MALABSORPTION IN EXOCRINE PANCREATIC INSUFFICIENCY. *(Ger.)* Aenishanslin, H. W.; Stalder, G. A. (Med. Polyclin., Univ. Basel, Switzerland). *Dtsch. Med. Wochenschr.* 99(41):2033-2035, 1974.

See also, 0098, 0116, 0335, 0336, 0337, 0361, 0362, 0363, 0364, 0365, 0366, 0422, 0648, 0655, 0673, 0696, 0702.

PANCREAS

Pancreatitis

0538 ACUTE PANCREATITIS IN PREGNANCY. *(E.)* Jouppila, P.; Mokka, R.; Larmi, T. K. I. (Oulu Univ. Cent. Hosp., Finland). *Surg. Gynecol. Obstet.* 139(6):879-882, 1974.

Over a 2 yr period 8 pregnant patients were admitted with acute pancreatitis. This represented an incidence of 1 for every 2,302 deliveries. Acute pancreatitis was contracted between 11-29 weeks of pregnancy. The mothers were 23-35 yr old and para 1, 2, 3 and 4. On admission 3 of the patients were thought to have an acute condition of the abdomen. Jaundice was present in 6 patients. Laboratory tests showed elevated blood and urine amylase levels in all patients; serum lipase levels were elevated in 4 patients and serum calcium levels were subnormal in 4. Mild leukocytosis was present in 4 and moderate leukocytosis in the others. In 6 patients, the levels of serum bilirubin or serum alkaline phosphatase or both were elevated, and in 4 the SGOT levels were high. After diagnosis was made, the patients were started on nasogastric suction and intravenous fluid therapy. Antibiotics (ampicillin in 7 and penicillin G with streptomycin in 1), an antispasmodic (Baralgin), and anticholinergic drugs (either atropine s.c. or propantheline bromide i.m.) were used in the treatment. Three patients had recurrence of pancreatitis during the same pregnancy and 1 was operated for obstructive jaundice. Cholelithiasis was present in 5 of the patients. All 8 patients survived, but 3 fetuses were lost. The role of pregnancy in acute pancreatitis is unclear, but it has been noted that the gallbladder becomes larger and empties less effectively than usual, possibly due to changes in flow conditions of the bile caused by high progesterone levels. Cholelithiasis is still considered the most common etiological factor and surgical intervention is indicated even during pregnancy when unremitting pancreatitis is dangerous to life.

0539 SURGICAL MANAGEMENT OF ACUTE AND CHRONIC PANCREATITIS. *(E.)* Hermann, R. E. (Cleveland Clin., Ohio). *Clin. Med.* 81(8):24-26, 1974.

0540 PANCREATITIS. A PROSPECTIVE CLINICAL EVALUATION OF 100 CASES AND REVIEW OF THE LITERATURE. *(E.)* Olsen, H. (Providence Hosp., Oakland, Calif.). *Am. J. Dig. Dis.* 19(12):1077-1090, 1974.

0541 HEMORRHAGE IN PANCREATIC INFLAMMATORY PSEUDOCYST. (REVIEW OF LITERATURE AND REPORT OF A CASE OF MASSIVE MELENA CAUSED BY HEMORRHAGE INTO A PANCREATIC PSEUDOCYST COMMUNICATING WITH THE PANCREATIC DUCTS). *(It.)* Pasquali, E.; Corsi, A. (Prov. Gen. Hosp., Conegliano, Italy). *Chir. Gastroenterol.* 7(4):554-562, 1973.

0542 PATHOGENESIS OF ACUTE PANCREATITIS. *(Gr.)* Polyzos, J. (Dep. Pathol., Natl. Capodistrian Univ., Athens, Greece). *Iatriki* 23(6):453-469, 1973.

0543 RECENT ADVANCES IN THE TREATMENT OF ACUTE HEMORRHAGIC NECROTIZING PANCREATITIS. *(Fr.)* Hollender, L. F. (Univ. Hosp. Cent., Strasbourg, France). *Bull. Acad. Natl. Med. (Paris)* 158(2):130-138, 1974.

0544 ACUTE NECROTIZING PANCREATITIS. AN EXPERIMENTAL MODEL. *(E.)* Bawnik, J. B.; Orda, R.; Wizniter, T. (Ichilov Hosp., Tel Aviv, Israel). *Am. J. Dig. Dis.* 19(12):1143-1147, 1974.

0545 ON 135 CONSECUTIVE CASES OF ACUTE PANCREATITIS. *(Fr.)* Simard, E.; Gagnon, G.; Beaudry, E.; Brisson, F.; Bergeron, C.; Charbonneau, A. (Hosp., Chicoutimi, Canada). *Union Med. Can.* 103(9):1578-1581, 1974.

0546 INTESTINAL FISTULA COMPLICATING PANCREATIC ABSCESS. *(E.)* Mason, H. D. W.; Forgash, A.; Balch, H. H. (District Columbia Gen. Hosp., Washington). *Surg. Gynecol. Obstet.* 140(1):39-43, 1975.

0547 COMPLICATIONS OF CHRONIC PANCREATITIS. *(E.)* Lewis, T. D. (Repatriation Gen. Hosp., Heidelberg, Australia). *Aust. NZ J. Med.* 4(5):518-521, 1973.

0548 EXTRINSIC STENOSIS OF THE LEFT COLONIC ANGLE BY CHRONIC PANCREATITIS. *(Fr.)* Briet, S.; Favre, J. P.; Sgro, J. C.; Viard, H. (Bocage Hosp., Dijon, France). *Lyon Chir.* 70(5):323-324, 1974.

0549 AMYLASE PLEURISY AND SPONTANEOUS RUPTURE OF THE SPLEEN IN CHRONIC CALCIFYING PANCREATITIS. *(Fr.)* Turiaf, J.; Battesti, J. P.; Pessayre, J. R.; Boutelier, P.; de Tayrac, R. (Bichat Hosp., Paris, France). *Ann. Med. Interne (Paris)* 125(6/7):527-532, 1974.

See also, 0098, 0333, 0337, 0338, 0371, 0527.

LIVER AND BILIARY TRACT

0550 ESTIMATION OF THE FUNCTIONAL RESERVE OF HUMAN LIVER. *(E.)* Moody, F. G.; Rikkers, L. F.; Aldrete, J. S. (Univ. Utah Med. Cent., Salt Lake City.). *Ann. Surg.* 180(4):592-598, 1974.

Functional hepatic reserve was determined in 32 patients with known liver or biliary tract disease (8 with alcoholic cirrhosis, 5 with biliary or postnecrotic cirrhosis, 5 with portal decompression, 14 with a variety of liver disturbances) employing kinetic analysis of hepatic removal of indocyanine green. The initial removal rates of incremental i.v. doses of indocyanine green (0.5, 1.0, and 5.0 mg/kg) were plotted as a reciprocal against the inverse of dose (Lineweaver-Burk plot) to provide a means of determining maximal removal rate from submaximal doses. Blood was withdrawn before and at 5, 10, and 15 min intervals following administration of the dye. The maximal removal rate, which was 3.40 mg/kg/min in 10 control patients, was only 0.24 mg/kg/min in 8 patients (5 male and 3 female, ages 35-58 yr) with alcoholic cirrhosis. Portasystemic shunting did not further influence the maximum removal rate of the dye, and infiltrative liver disease had only a mild depressive effect on this function. The results demonstrate that hepatic function can be precisely quantitated by classical enzyme kinetics (Michaelis-Menten). If the maximum removal rate of indocyanine green from the blood (*via* the liver) is an estimate of protein receptor mass for organic anions, then the technique may allow an indirect means for quantitating hepatocytes even in the presence of changes in blood flow or hepatic function. The profound depression in this removal rate observed in patients with alcoholic cirrhosis is consistent with the progressive loss in hepatic mass associated with this disease.

0551 A PRACTICAL APPROACH TO QUANTITATE HEPATIC EXCRETORY FUNCTION. *(E.)* Bircher, J.; Hacki, W. (Dep. Clin. Pharmacol., Univ. Bern, Switzerland). *Yale J. Biol. Med.* 3(47):196-201, 1974.

In a group of patients with various liver diseases and in normal control subjects, the 3 BSP tests used to assess hepatic function, namely BSP retention, BSP plasma disappearance curve, and BSP transport maximum (BSP *Tm*), were carried out in one session. The BSP disappearance curves were measured within 30 sec. after the i.v. injection of 5 mg/kg BSP. Blood samples were obtained at 2-5 min intervals up to 45 min beginning 3 min after injection. The last sample was used to calculate BSP retention assuming an initial concentration of 10 mg/100 ml. The BSP *Tm* was determined indirectly with the two-infusion method. The logarithm of the BSP retention correlated linearly with the excretory capacity of the liver as revealed by the BSP *Tm*. There was a close correlation between the logarithms of the second component (k_2) of the disappearance curve and the BSP *Tm*, suggesting that k_2 is mainly determined by the excretory capacity of the liver. It is suggested that the use of BSP k_2 and of BSP retention U should be valuable in the follow-up of patients treated for chronic liver disease. Because of its better established physiological basis, the BSP k_2 is directly applicable to the individual patient and, therefore, may be preferred.

0552 STUDY OF LIVER FUNCTION IN CHILDREN USING ^{131}I-LABELED BENGAL ROSE. *(Rus.)* Ermakova, T. M. (I.M. Sechenov 1st Moscow Med. Inst., USSR). *Pediatriia* (12):19-20, 1973.

Studies of 22 patients with systemic lupus erythematosus by ^{131}I-labeled bengal rose showed serious hepatic absorption and secretion disorders. Half-life periods varied between 6-102 min for absorption (normally 6-12 min); 19-1225 min for excretion (80-120); 4-570 min for purification (6-20): vascularization ranged between 40 and 98% (98-99%, normally). Findings indicate a serious subclinical liver deficiency involving the vascular system. Standard biochemical tests did not reveal any significant changes of the liver function.

0553 DETERMINATION OF THE SERUM GUANASE ACTIVITY IN DISEASES OF THE HEPATIC PARENCHYMA.

(Ger.) Kramp, B.; Teichmann, W.; Rehpenning, W. (Dep. Gastroenterol., Univ. Rostock, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 33(1):11-16, 1973.

The serum guanase activity was measured by Kramp's modified method in 21 patients with acute viral hepatitis, 16 with chronic aggressive hepatitis, and in 21 with cirrhosis to determine the diagnostic value of this parameter. Increased serum guanase activity was measured in 18 cases of acute viral hepatitis during the first 10 days of the disease, while the SGOT and SGPT activities showed increase in 17 cases each. Pathologically increased guanase activity, and increased SGOT and SGPT activities were found in 13 and 7 cases of chronic aggressive hepatitis, resp. Pathological increase of the guanase activity was observed in 15 cases of cirrhosis, while the SGOT and SGPT activities were pathologically high in 12 and 7 cases, resp. Serum guanase activities measured in acute viral and chronic aggressive hepatitis, and cirrhosis were in the ranges of 0-155.3 mU/ml (average 35.8 mU/ml); 0-49.8 mU/ml (average 13.8 mU/ml), and 0-2.9 mU/ml, resp. The findings indicate that the serum guanase activity test fails to offer special advantages over the transaminase tests in chronic liver diseases, but it is especially suitable for the early differential diagnosis of viral hepatitis.

0554 ACTIVATION ANALYSIS OF HUMAN TISSUE SAMPLES: MANGANESE, COPPER, AND ZINC IN THE LIVER.

(Ger.) Leonhardt, W.; Niese, S.; Jaross, W.; Hanefeld, M.; Schentke, K. U.; Renger, F. (Carl Gustav Carus Med. Acad., Dresden, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 33(1):17-24, 1973.

Manganese, copper, and zinc contents were determined by radioactive irradiation in liver biopsies from rats, from 3 patients with hypertriglyceridemia, 4 patients with fatty liver, and 6 chronic alcoholics. Rat liver samples contained 6.1 ppm Mn, 15.1 ppm Cu, and 113 ppm Zn. The normal values in human liver were found to be 7.6 ppm Mn, 40 ppm Cu, and 181 ppm Zn. The corresponding values determined in fatty liver were 8.9 ppm Mn, 31 ppm Cu, and 135 Zn. Zn content was found to decrease with increasing triglyceride level in the liver. Correlation coefficients of 0.576, 0.599, and 0.448 were determined for the relation between the levels of Mn and Cu, Zn and Cu, and of Mn and Zn. Investigations of the Mn, Cu, and Zn levels in liver biopsies from alcoholics before and after tapering-off showed no clear tendency in the trace element concentrations.

0555 LIVER TRANSPLANTATION IN CHILDREN WITH BILIARY ATRESIA AND VASCULAR ANOMALIES.

(E.) Lilly, J. R.; Starzl, T. E. (Univ. Colo. Med. Cent., Denver). *J. Pediatr. Surg.* 9(5):707-714, 1974.

Of 29 children having liver transplant for biliary atresia, 8 (27.5%) had associated vascular anomalies. In 3 of the latter a composite vascular malformation characterized by absent inferior vena cava, preduodenal portal vein and anomalous hepatic artery was also present, as well as visceral malformations such as intestinal malrotation, polysplenia or liver symmetry. The remaining 5 children had anomalous hepatic artery vasculature (4 cases) and malformation of the hepatic veins (1 case). All 3 infants with multiple vascular and visceral anomalies died shortly after liver homograft surgery. The visceral anomalies provide a special clue to the detection of this special group of infants with biliary atresia and multiple vascular malformation, and a radiologic study of the intestine with barium examination of the gastrointestinal tract should be a routine work-up for infants with jaundice. The polysplenia or liver symmetry seen at laparotomy should alert the surgeon to the possiblity of multiple vascular anomalies which make these patients a poor risk for successful liver transplant. A single variation of hepatic arterial or venous architecture is no contraindication for surgical correction and transplant.

0556 MAJOR HEPATIC RESECTION USING VASCULAR ISOLATION AND HYPOTHERMIC PERFUSION. *(E.)*

Fortner, J. G.; Shiu, M. H.; Kinne, D. W.; Kim, D. K.; Castro, E. B.; Watson, R. C.; Howland, W. S.; Beattie, Jr., E. J. (Mem. Sloan-Kettering Cancer Cent. New York, N.Y.). *Ann. Surg.* 180(4):644-652, 1974.

A technique for *in vivo* isolation and asanguinous perfusion of the liver which permits hepatic resection to be performed under controlled conditions is described along with results from 29 major hepatic resections using the method. After isolation of the liver, the gastroduodenal artery is cannulated with a silastic catheter (1.1 mm internal diameter and 2.7 mm external diameter). The portal vein is cannulated either *via* a venotomy or *via* the branch of the lobe which is to be resected. These cannulae are kept patent with a slow infusion of Ringer's lactate at room temperature. The common bile duct is then occluded with a small Pott's clamp, and the liver is ready for hypothermic perfusion. The common hepatic artery and portal vein are clamped proximal to the cannulae. The infrahepatic vena cava and suprahepatic vena cava are separately occluded by vascular clamps, and a cavotomy is made immediately inferior to the liver for placement of a number 32 French catheter to drain the perfusate. Ringer's lactate solution, chilled to 4 C and with 5 mg/liter heparin, is passed through coiled tubing immersed in ice to the hepatic artery and portal vein. After traversing the liver, the solution exits through the hepatic veins into the vena cava. The liver is ready for asanguinous resection after obtaining adequate chilling of the parenchyma and checking for complete vascular isolation. Out of 29 patients undergoing the procedure, 26 survived. In 1 patient, isolation of the liver was incomplete and blood leaked into the system, resulting in hypovolemia, cardiac standstill, and death. Another patient died of pulmonary embolism 6 hr postoperative, while a 3rd patient died of hepatorenal syndrome about 4 weeks after surgery. Subphrenic abscess and wound infection were the most prominent complications. Resectability rate in the series of patients was 34%. Examples of surgical problems that can be dealt with using the method are: resection of major hepatic veins flush with the vena cava, removal of a portion of the vena caval wall, excision of neoplastic involvement of liver tissue adjacent to vena cava, and neoplastic thrombosis of the portal vein.

0557 PRIMARY LIVER CANCER: A CLINICAL STUDY. *(Ger.)* Rostock, K. J.; Claus, R. (Med. Clin., Univ. Rostock, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 33(4/5):193-198, 1973.

Fifty cases of primary carcinoma and 2 cases of hemangioendothelioma of the liver, observed between 1960 and 1972, are analyzed. Hepatocellular carcinoma in 33 cases, hepatocellular carcinoma with liver cirrhosis in 16 cases, cholangiocellular carcinoma in 17 cases, and those with cirrhosis in 4 cases were diagnosed. The patients included 32 males and 20 females, mostly aged 50-80 yr. Eleven cases of septal, 8 cases of postdystrophic, 1 case of biliary cirrhosis were found pathoanatomically, while clinical investigations revealed 12 cases of alcohol-induced cirrhosis, and 6 cases of hepatitic cirrhosis. Hypersplenism was detected in 11 out of 46 cases. Esophageal varices were found in cirrhotic patients only. Stenosis of the biliary duct due to tumor infiltration, hepatocellular and cholangiocellular carcinomas of the biliary duct were detected in 15, 9, and 8 cases, resp. Metastases were found most often in the liver, lungs, pleura, peritoneum, adrenal gland, skeleton, gallbladder, ovary, thyroid gland, kidney, brain, and lymph nodes. Ascites and pylethrombosis were found in 30 and 16 cases, resp. The serum bilirubin level, aspartate amino transferase activity, prothrombin and serum iron levels showed no significant changes, while the serum albumin, α_2- and β-globulin levels were pathological. The first symptom of the liver carcinoma was pain in 28 cases, jaundice in 6 cases, fever in 3 cases, and increase in the body circumference in 4 cases.

0558 RESULTS OF THE TREATMENT OF HEPATOCELLULAR CARCINOMA. *(Jpn.)* Kuroyanagi, Y.; Akaza, T. (Aichi Cancer Cent. Hosp., Japan). *Gan No Rinsho* 19(5):488-494, 1973.

The results of treatment of hepatocellular carcinoma were studied in follow-ups of 88 patients treated from 1964 through 1972. Group A patients were those seen from 1964 through 1968, before the development of the serum α-fetoprotein test, and whose diagnosis was based on hepatoscanning or selective angiography. Group B included the remainder of the patients. Treatment was by hepatic resection (5 cases), radiation combined with intra-arterial mitomycin C (22), single arterial mitomycin C (34), or a combination of venous mitomycin C, Tespamin, Endoxian and toyomycin (3). No treatment was given to 24 patients, who all died within 1 month. A single arterial injection of 20 mg mitomycin C was given to 3 of the 5 hepatic resection cases 1 week before surgery: 2 of these later developed serum metastasis to the lung and right pelvis, indicating that pre-operation treatment with mitomycin C was not effective. The 2 remaining surgical patients died of intestinal obstruction after 69 months and lung cancer after 58 months, resp.; however, no metastasis was observed to the remaining liver. In the radiation combined with Mitomycin C treatment, Betatron (cobalt 60) treatment was continued after the single arterial injection of 30 mg Mitomycin C. The effective radiation quantity was reached in 13 to 14 days of irradiation and was between 800 to 1500 r. At this quantity, the serum α-fetoprotein level was decreased to 86-88% of its initial level. The average survival period with this treatment was 10.7 months and 5.8 months for non-cirrhotic and cirrhotic hepatocellular carcinoma patients, resp. The single arterial mitomycin C treatment extended patient lives for only 4 months. The effectiveness of multi-drug venous injection, namely, 10 mg mitomycin C, 70 mg Tespamin, 3.5 mg Endoxian, and 3.5 mg toyomycin, was not observed clearly because of the complicated conditions of the patients, who all died within 2 months. Of the 88 original patients, the two treated by hepatic resection alone had the longest survival time, and had no evidence of further carcinomatous involvement.

0559 GLUTAMATE DEHYDROGENASE ACTIVITY RELATED TO HISTOPATHOLOGICAL GRADE OF HEPATOCELLULAR CARCINOMA IN MAN. *(E.)* Glazer, R. I.; Vogel, C. L.; Patel, I. R.; Anthony, P. P. (Dep. Pharmacol., Emory Univ., Atlanta, Ga.). *Cancer Res.* 34(11):2975-2978, 1974.

Twenty cm^3 blood was collected from each of 25 primary hepatocellular carcinoma patients (16 male, 9 female, 22-62 yr old). The sera was separated within 1 hr of collection and used for determinations of α-fetoprotein (AFP), protocollagen proline hydroxylase, alkaline phosphatase, and SGOT, and for serum bilirubin studies. Glutamate dehydrogenase was determined spectrophotometrically in biopsy samples of the primary tumor. Abnormally high activities of protocollagen proline hydroxylase, alkaline phosphatase, and SGOT were found in 53, 84, and 95% resp. of the patients with primary hepatocellular carcinoma. AFP levels ranged from 8 ng to 1.92 mg/ml; 75% of the patients had serum concentrations of AFP greater than 40 ng/ml. Bilirubin concentrations were elevated in only 21% of the patients. When the hepatic glutamate dehydrogenase activities were grouped according to the histological grade of the hepatocellular carcinoma, there was a suggestion of decreasing glutamate dehydrogenase activity with increasing anaplasia. Glutamate dehydrogenase activity of the hepatoma was significantly less than that obtained from adjacent normal or cirrhotic liver. Analyses of serum levels of AFP also suggested a correlation between the amount of AFP and the histopathological grade of the carcinoma.

0560 DIFFERENTIAL DIAGNOSIS OF NODULAR LESIONS IN THE LIVER OF MAN. *(Ger.)* Sterba, J.; Slais, J. (Parasit. Inst., Prague, Czechoslovakia). *Zentralbl. Allg. Pathol.* 118(2/3):124-131, 1974.

Systematic histological study of 122 human liver nodules obtained at autopsy and biopsy is described.

Solitary tumor metastases and specific granulomas were excluded from the investigation. Three different groups of liver nodules were distinguished: regressive and resorptive processes following different lesions (76 cases); parasitic granulomas and undetermined conditions (8 cases). The 1st group included serous cysts (35 cases), hyalinized angiomas, pseudoparasitic granulomas, implanted appendices epiploicae, and calcified focal liver necroses. Serous cysts showed focal dystrophic calcification and subcapsular localization. Pseudoparasitic granulomata from embolized plant parts *via* the portal vein due to rupture of the duodenum were localized in the portal region. Supracapsular pseudotubercles with partial necrotization and hyalinization due to plant seed was found in 1 case. Solitary calcified nodules due to coagulation necrosis was found in 4 cases. Special techniques and reconstruction were necessary for the diagnosis of parasitic granulomas caused by *Echinococcus granulosus, Linguatula serrata, Cysticercus tenuicollis, Enterobius vermicularis,* and *Capillaria hepatica,* the latter being detected for the 1st time in Europe in 7 cases. The identification of parasites, migrating to the liver from the intestine *via* the portal vein, is difficult due to resorption, necrosis, and calcification.

0561 ALPHA FETOPROTEIN: AN INDEX OF PROGRESSION OR REGRESSION OF HEPATOMA, AND A TARGET FOR IMMUNOTHERAPY. *(E.)* Parks, L. C.; Baer, A. N., Pollack, M.; Williams, G. M. (Johns Hopkins Univ. Sch. Med., Baltimore, Md.). *Ann. Surg.* 180 (4):599-605, 1974.

Studies of α-fetoprotein (AFP) producing hepatomas in humans and mice were performed to investigate possible correlations between serum AFP levels and tumor growth and to assess the ability of highly specific anti-AFP as a carrier for localizing diagnostic and possibly therapeutic amounts of radioactivity in hepatoma tissue. Measurements of serum AFP in patients with hepatomas, using a rabbit anti-human AFP as antisera, indicated a positive correlation between AFP titer and clinical status when the patient was used as his own control. Abnormal serum AFP levels in 2 patients with hepatomas resected for cure returned to normal over a period consistent with the 6-day half-life for circulating AFP. Recurrent disease was first detected by the reappearance of elevated AFP levels. Effective palliative anti-tumor therapy (5-fluorouracil, 12 mg/kg/week i.v.) did not cause any transient elevation of serum AFP levels which might be expected to accompany tumor cell destruction. Experiments with adult C57L/J mice bearing transplanted hepatomas (*via* s.c. placement) indicated that the sera of such animals positive for AFP at a titer of 1:64 could be cleared of circulating AFP by a single injection of 0.5 ml of anti-AFP. AFP titers fell to zero within 1 hr after injection. Although AFP serum activity resumed 10-18 hr post-injection, animals receiving repeated injections of 0.25 or 0.5 ml anit-AFP for 14 consecutive days after tumor inoculation remained clear until day 8. An initial attempt to utilize anti-AFP as a carrier for localizing selectively significant amounts of ^{131}I failed because the amount of anti-AFP antibody was low in relation to the amount of labeled but different immunoglobulin G. However, anti-AFP antibody concentrated by precipitation with the specific antigen and dissociated from it by acidification and sephadex column purification did localize significantly in hepatoma (3 times the radioactivity of that found in hepatomas exposed to normal immunoglobulin G). The tumor:blood ratio of isotope activity was greater than 6:1 by the 6th post injection day, and therefore within the range suggested as necessary to localize therapeutic amounts of radioactivity.

0562 FOCAL HYPERFIXATION OF RADIOCOLLOID BY THE LIVER. *(E.)* Pasquier, J.; Dorta, T. (Cantonal Hosp., Fribourg, Switzerland). *J. Nucl. Med.* 15(8):725, 1974.

A liver scan in a 37-yr-old woman showed a "hot spot" which corresponded to a palpable mass in the epigastrium. Left liver-lobectomy, performed when angiography suggested a tumor, revealed a well-defined tumor in the left lobe of the liver. Histologic diagnosis was a hamartoma.

0563 STUDIES ON LIPID AND FATTY ACID COMPOSITION OF HUMAM HEPATOMA TISSUE. *(E.)* Araki, E.; Phillips, F.; Privett, O. S. (Hormel Inst., Univ. Minnesota, Austin). *Lipids* 9(9):707-712, 1974.

Studies were conducted on the lipid composition of normal liver and hepatoma obtained at autopsy from 8 human adults. Normal tissue was obtained from 3 patients who died of massive gastrointestinal bleeding. Total lipids were fractionated by sialic acid column chromatography into neutral lipid, glycolipid and phospholipid fractions which were further analyzed by thin layer chromatography. Constituent fatty acids were analyzed by gas liquid chromatography. Compared to normal liver tissue, hepatoma had a generally much higher, but more variable total lipid content (12.8-92.7 gm%) which was primarily due to increased neutral lipids (9.4-76.7 gm%). Although the glycolipid content of hepatomas was about the same as that of normal liver (0.6-0.8 gm%), phospholipid content was much lower (2.9-12.0 *vs* 11.7-13.7 gm%). Neither normal liver nor hepatoma tissue had any glyceryl ether diesters and both contained only traces of plasmalogens of phosphatidylcholine or phosphatidyl ethanolamine. Hepatomas contained higher levels of monoenoic acids and lower levels of linoleic and polyunsaturated fatty acids. Positional isomers of trienoic acids not normally present in liver tissue were detected in hepatoma tissue. The abnormalities in lipid composition observed in hepatoma tissue suggest that the normal regulatory processes of lipid metabolism are altered in a manner similar to those observed in tumors from animals.

0564 A RARE, HEREDITARY DISEASE WITH CHOLESTEROL ESTER STORAGE IN THE LIVER. *(Ger.)* Wolf, H.; Hug, G.; Michaelis, R.; Nolte, K. (Pediatr. Ward, Acad. Hosp., Kassel, Germany). *Helv. Paediatr. Acta* 29(2):105-118, 1974.

Follow-up observations for 10 years of cholesterol ester storage disease in a 17 yr-old girl are presented. Persistent type II hyperlipidemia and hepatomegaly were determined as the only abnormal clinical findings. Repeated liver biopsy specimens indicated excessive cholesterol esters both in liver cells and in the small intestinal mucosa. Acid lipase activity was deficient in the skin fibroblast cultures, while the other 7 lysosomal hydrolases showed normal activity. Serum lipid tests revealed a total cholesterol level of 400 mg/100 ml, a free cholesterol level of 150 mg/100 ml, a phosphatide level of 376 mg/100 ml, a neutral fat level of 353 mg/100 ml, a total ester fatty acid level of 750 mg/100 ml, and a total fat level of 1,325 mg/100 ml. Increased ester fatty acid, phosphatide, and cholesterol levels were demonstrated in both the father and mother of the patient. Additionally, the father had moderate hepatomegaly. One of the two siblings of the patient was found to have developed hepatomegaly, nearly pathological cholesterol level, and considerable fat storage in the astrocytes.

0565 DIVERSION OF THE HEPATIC ARTERIAL FLOW INTO THE PORTAL VEIN IN THE BUDD-CHIARI SYNDROME. *(E.)* Deutsch, V.; Adar, R.; Bogokowsky, H.; Itzchak, Y.; Mozes M. (Chaim Sheba Med. Centr., Tel-Hashomer, Israel). *Blood Vessels* 11(1/2):96-100, 1974.

A case of autopsy-proven primary Budd-Chiari syndrome with complete occlusion of all intrahepatic veins is described in which celiac angiography was successfully used to make a correct preoperative diagnosis. The patient, a 23-yr-old male, presented with hematemesis and melena. He was pale and slightly jaundiced. Spider angiomata were observed over the skin of the chest, and the abdomen was swollen with shifting dullness. The liver and spleen were not palpable. Hematologic laboratory tests showed anemia, hyperbilirubinemia (3.2 mg%), and mild abnormalities of liver function. Esophageal varices were suspected on barium swallow. Celiac and selective hepatic angiography demonstrated an enlarged liver, a slightly dilated hepatic artery, and intrahepatic branches with normal appearance and distribution. In the capillary phase of the selective hepatic injection, the intrahepatic portal vein branches were visualized. Long after the capillary phase, the splenic vein was not visualized. Superior mesenteric arterial injection revealed in the portovenous phase a dilated coronary vein with a rich collateral network. A diagnosis of hepatic vein occlusion was suspected on the basis of portal hypertension with extensive collaterals, direct filling of the intrahepatic portal vein from the hepatic artery, and an enlarged liver with normal vascular pattern. A portacaval shunt was constructed at surgery after which the portal pressure decreased from 44 to 28 cm H_2O. Postoperative hepatic encephalopathy appeared, and 2 episodes of gastrointestinal hemorrhage occurred. The patient died 10 days following the operation. Post mortem revealed a patent portacaval shunt, but with a thrombus partially occluding the portal vein 2 cm proximal to the anastomosis. With reticulum and collagen stains, the central hepatic veins were seen completely occluded by dense fibrosis. The larger hepatic veins were partially obliterated by intimal proliferation, some by organizing thrombus, while the major hepatic veins contained recent thrombus. The histological findings were indicative of primary Budd-Chiari syndrome (veno-occlusive disease). The direct evidence of shunting of blood from the hepatic artery into the portal vein, together with consideration of the angiographic pattern of the intrahepatic arterial branches, should be considered as very suggestive for the diagnosis of Budd-Chiari syndrome.

0566 ASSOCIATION OF REYE'S SYNDROME WITH VIRAL INFECTION. *(E.)* Linnermann, Jr., C. C.; Shea, L.; Kauffman, C. A.; Schiff, G. M.; Partin, J. C.; Schubert, W. K. (Univ. Cincinnati Coll. Med., Ohio). *Lancet* (7874):179-182, 1974.

From January to March 1974, 24 cases of Reye's syndrome (14 boys and 10 girls, mean age 7.7 yr) were diagnosed in Cincinnati, Ohio. In 16 cases the diagnosis was confirmed by liver biopsy. The epidemic coincided with an epidemic of influenza B, intermediate type. In 18 of the 23 cases (78%) in which viral studies were done, an acute viral infection was found in either the patient or a close contact with similar prodromal symptoms. Influenza-B infection was confirmed in 12 patients and 12 contacts, although influenza A, parainfluenza 1, adenovirus, and varicellazoster virus also occurred. In 4 cases, there was evidence of a mixed viral infection of patients or their contacts. Normal responses to phytohemagglutinin and specific viral antigen were obtained in cellular immunity studies performed on 6 patients. This is the first epidemic of Reye's syndrome clearly associated with viral infection.

0567 TREATMENT OF AMEBIC LIVER ABSCESS WITH EMETINE HYDROCHLORIDE, NIRIDAZOLE, AND METRONIDAZOLE. *(E.)* Datta, D. V.; Singh, S. A. K.; Chhuttani, P. N. (Postgrad. Inst. Med. Educ. Res., Chandigarh, India). *Am. J. Trop. Med. Hyg.* 23(4):586-589, 1974.

Three groups of 20 patients each with amebic liver abscesses were treated with 1 of the following antiamebic regimens: emetine hydrochloride (1 g i.m. for 10 days) with chloroquine diphosphate (250 mg 2 times/day for 20 days); niridazole (500 mg 3 times/day for 10 days); or metronidazole (400 mg 3 times/day for 10 days). Emetine + chloroquine resulted in 19 clinical cures. Clinical failure occurred in 1 of 2 patients who developed hypotension; this patient had associated rupture of the abcess into the peritoneum and had aspirated 800 ml of amebic pus after receiving only 1 g emetine. The other patient with hypotension recovered after emetine was reduced to 0.5 g for 3 days. Vomiting in 2 patients responded to antihistamines, and psychosis in 1 was relieved by withdrawing chloroquine. Of the 18 patients who completed the 10-day course of niridazole, 14 were cured. In 2 patients therapy was discontinued because of severe hallucinations, involuntary movements, and behavior changes. Recovery followed subsequent treatment with phenobarbital and metronidazole. A 3rd patient died from hemorrhage into the abscess and a 4th developed peritonitis and paralytic ileus; the latter responded to emetine + chloroquine. Niridazole also caused severe vomiting (1 case) and hyperreflexia (2). Clinical failure occurred in 7 patients treated with metronidazole and in 4 of these *E. histolytica* was demonstrated in the hepatic aspirate at the end of therapy. One of the 7 patients developed severe hypotension and died after 3 days of treatment; autopsy revealed multiple abscesses teeming with *E. histolytica*. The other 6 patients responded to emetine-chloroquine therapy. Hallucinations in 1 patient and vomiting in 2 responded to phenobarbital. Information regarding absorption of different doses of metronidazole in amebic liver abscesses is lacking; higher dosages may prove more effective.

0568 VITAMIN B_{12} ABSORPTION IN CHRONIC LIVER DISEASE. *(Ger.)* Konrad, H.; Teichmann, W.; Kiencke, H.; Bielka, B.; Claus, R. (Med. Clin., Univ. Rostock, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 33(4/5):179-183, 1973.

The radiolabeled vitamin B_{12} resorption was studied in 170 patients with different degrees and durations of chronic hepatic diseases, such as liver cirrhosis, chronic hepatitis, fatty liver, cardiac liver cirrhosis, and hepatocarcinoma by Schilling's vitamin B_{12}-urine excretion test. The vitamin B_{12} resorption showed an overall decrease in the patients, and pronounced pathological reduction in the vitamin B_{12} resorption was found in 30 patients (17.6%). While the vitamin B_{12} resorption was normal in 26 patients with chronic aggressive hepatitis and 17 patients with chronic persistent hepatitis, 11.8% of the 135 patients with cirrhosis, chronic hepatitis, and fatty liver showed pathological resorption values. The disturbance in the vitamin B_{12} resorption was most common in cardiac liver cirrhosis and hepatocarcinoma. Repeated tests with the addition of intrinsic factor (porcine powdered pylorus mucosa) showed normalization of the vitamin B_{12} resorption in most cases of cirrhosis, chronic hepatitis, and fatty liver. This effect was absent in certain patients, especially those with cardiac liver cirrhosis. About one third of the patients with pathological Schilling test had anemia. The anemia was mostly normochromic, and hyperchromic or hypochromic forms were found in a few cases.

0569 INTRACISTERNAL HYALIN IN HEPATOCYTES OF HUMAN LIVER BIOPSIES. *(E.)* Pfeifer, U.; Klinge, O. (Inst. Pathol., Univ. Wurzburg, Germany). *Virchows Arch.* [*Zellpathol.*] 16(2):141-155, 1974.

Further histologic studies have been conducted using liver biopsy material from 2 patients with cirrhosis and 1 with progressive liver damage to characterize one form of hepatocellular hyalin which accumulates inside the cisternae of the rough endoplasmic reticulum. The staining properties and ultrastructure of the material was not the same in the 3 cases. The PAS reaction was positive in only 1 specimen. The size of the hyalin inclusions varied considerably with the largest ones being 15 μ in one case but only 5-7 μ in the others. Ultrastructural studies showed that the inclusions were bounded by a single membrane similar to that of the endoplasmic reticulum. Attached ribosomes were common in two cases but rare in the 3rd. Occasional communications were noted between the inclusions and the endoplasmic reticulum. The substance within the inclusions was rather homogeneous in 2 cases and consisted of a pattern of irregularly arranged 400 Å tubules in 1 case. The inclusions were negative for acid phosphatase. The inclusions in 2 of the cases definitely did not represent accumulation of α_1-antitrypsin as has been noted in patients with α_1-antitrypsin deficiency. The accumulation could be a result of defective protein transport, of defective protein coupling or of synthesis of a defective protein.

0570 LIVER FINDINGS IN PRIMARY HYPERLIPOPROTEINEMIA (HLP). *(Ger.)* Renger, F.; Hanefeld, M.; Jaross, W.; Stotzner, H.; Kemmer, C.; Leonhardt, W.; Trubsbach, A.; Schentke, K. U. (Carl Gustav Carus Med. Acad., Dresden, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 33(4/5):199-203, 1973.

Histological and biochemical liver findings in 6 cases of primary hyperlipoproteinemia type II and in 36 patients with primary hyperlipoproteinemia (HLP) types III-V are presented. The normal histological findings in hyperlipoproteinemia type II indicate that hypercholesterolemia *per se* fails to cause any serious morphological changes. Lipacidemia, hyperinsulinemia, and disturbances in the triglyceride metabolism were found in HLP types III-V. Steatosis hepatis was found in 33 cases (92%). Slight mesenchymal changes were detected despite massive fatty degeneration. Fine structural changes of the hepatocytes, mostly in the form of swelling with moderate to pronounced dilatation of the granular and agranular endoplasmic reticulum were found in electron microscopic investigations. The bile capillaries were often dilated, and small bile lipid occlusions were found in the surrounding plasma. Polymorphy of the mitochondria, giant mitochondria with paracrystalline occlusions, and amorphous substance, possible lipoproteins in the intercellular spaces were observed. Increased triglyceride concentrations were found in biopsies from patients with types III-V HLP, while biopsies from type II HLP were nearly fat-free. Significant relationship between the Broca index and the triglyceride content was established. The observed close relationship between the free fatty acid and liver triglyceride levels is indicative of triglyceride accumulation due to lipacidemia in patients with type III-V HLP. Significantly increased total bile acid level was measured in these patients compared with patients with type II HLP and with a control group. Abnormally high frequency of pathological thymol levels was established.

0571 THE EFFECT OF PHENOBARBITAL ON INTRAHEPATIC CHOLESTASIS OF PREGNANCY. *(E.)* Espinoza, J.; Barnafi, L.; Schnaidt, E. (Sch. Med., Catholic Univ., Santiago, Chile). *Am. J. Obstet. Gynecol.* 119(2):234-238, 1974.

Nine patients were treated for intrahepatic cholestasis of pregnancy. Sodium phenobarbital (2.5 mg/kg/day) administered for 4-16 days normalized the serum bilirubin levels in 7 patients whose initial concentration did not exceed 5 mg/100 ml. Two patients with pre-treatment bilirubin exceeding this level had a 50% decrease following therapy. When one of these two patients received phenobarbital in doses of 5 mg/kg/day her bilirubin level became normal. The effect of the drug may be due to enzyme-inducing action in the liver cell or to marked choluretic action.

0572 HIGH DENSITY LIPOPROTEINS IN CHOLESTASIS. *(E.)* Blomhoff, J. P. (Rikshosp., Oslo, Norway). *Scand. J. Gastroenterol.* 9(6):591-596, 1974.

High density lipoproteins from 2 patients (65-yr-old female and 49-yr-old male) with cholestasis and increased concentrations of plasma free cholesterol (82 and 306 mg/deciliter, resp.) and phospholipids (376 and 1000 mg/deciliter, resp.) but normal concentrations of cholesteryl esters (176 and 143 mg/deciliter, resp.) were studied and compared with results from previously described alterations in high density lipoproteins from patients with familial lecithin:cholesterol acyltransferase (LCAT) deficiency. Plasma LCAT activities, as measured by the methods of Stokke and Norum or Glomset and Wright, were near normal in the female patient (48 and 74 μM/liter/hr, resp.) and slightly decreased in the male (29 and 58 μM/liter/hr, resp.). High density lipoproteins were isolated by ultracentrifugation and gelfiltration on hydroxylapatite. Subsequent filtration through Sephadex G-200 resulted in the separation of high density lipoproteins from the 2 patients with cholestasis into 2 peaks, whereas normal high density lipoproteins were eluted in 1 peak. The major peak was eluted with or slightly after the void volume, a pattern similar to that previously described for patients with familial LCAT deficiency. All subfractions contained relatively more polar lipids (free cholesterol and phospholipids) than apolar (triglycerides and cholesteryl esters). The demonstration of heterogeneity of high density lipoproteins in cholestasis, irrespective of a normal capacity for plasma cholesterol esterification, supports the theory that the increase in plasma cholesterol and phospholipids in cholestasis may exceed the capacity of the LCAT enzyme.

0573 BILE SALT SULPHATES IN CHOLESTASIS. *(E.)* Stiehl, A. (Dep. Med., Univ. Heidelberg, Germany). *Eur. J. Clin. Invest.* 4(1):59-63, 1974.

Bile salt sulfates were chromatographically determined in serum and 24-hr urine samples of 40 patients with severe cholestasis (serum bilirubin greater than 10 mg% and serum alkaline phosphatase greater than 600 mμ/ml). The patients were equally divided into groups suffering from extrahepatic obstruction, hepatitis, cirrhosis, and metastases of the liver. The specific activities of cholate and cholate sulfates were determined without prior separation of secondary bile salts following i.v. injection of 25 μCi ^{14}C-cholate to a patient with extrahepatic obstruction. Sulfate esters in the urine of patients with cholestasis accounted for 46.9% of cholate, 62.6% of chenodeoxycholate, 63.2% of deoxycholate, 87.5% of lithocholate, and 55.8% of the total bile salts excreted. Monosulfates represented 76.9%, disulfates 21.3%, and trisulfates 1.8%. Bile salt renal clearance rates were not significantly different in patients with extrahepatic obstruction, hepatitis, cirrhosis, and metastases of the liver. Clearance of sulfated bile salts was 15 times greater than that for nonsulfated bile salts. In contrast to the urinalysis findings, only 5% of serum bile salts were sulfated. Serum concentrations of sulfated and nonsulfated bile salts did not significantly differ among the various groups of patients with cholestasis. Urinary excretion of mono- and disulfates of bile salts thus appears to represent an important excretory mechanism in patients with cholestatic liver disease.

0574 HEPATOCELLULAR CARCINOMA: RELATION TO ALCOHOL, HB ANTIGEN AND ALPHA-FETOPROTEIN. *(E.)* Dourdourekas, D.; Villa, F.; Szanto, P. B.; Ainis, H.; Steigmann, F. (Cook Cty. Hosp., Chicago, Ill.). *Gastroenterology* 67(4):789, 1974.

0575 PERITONEOSCOPIC OBSERVATION OF CHEMOTHERAPEUTIC EFFECTS IN A PATIENT WITH HEPATOCELLULAR CARCINOMA. *(E.)* Okazaki, N.; Hattori, N.; Arima, M.; Ono, T.; Kanda, Y.; Koyama, S. (Natl. Cancer Cent. Hosp., Tokyo, Japan). *Jpn. J. Clin. Oncol.* 4(1):77-80, 1974.

0576 THE VALUE OF LIVER BIOPSY. *(E.)* Schaffner, F. (Mt. Sinai Sch. Med., City Univ. New York, N.Y.). *Lab. Med.* 5(10):15-16, 20, 1974.

0577 LIVER BIOPSY: COMPARISON OF RISKS IN OUT-PATIENTS AND IN-PATIENTS. *(E.)* McGill, D. B.; Ott, B. J.; Taylor, W. F. (Mayo Clin., Rochester, Minn.). *Gastroenterology* 67(4):814, 1974.

0578 ANTIBODY ACTIVATION OF MUTANT HUMAN FRUCTOSEDIPHOSPHATE ALDOLASE B IN LIVER EXTRACTS OF PATIENTS WITH HEREDITARY FRUCTOSE INTOLERANCE. *(E.)* Gitzelmann, R.; Steinmann, B.; Bally, C.; Lebherz, H. G. (Dep. Pediatr., Univ. Zurich, Switzerland). *Biochem. Biophys. Res. Commun.* 59(4):1270-1277, 1974.

0579 STUDIES ON LIVER ALDOLASES IN HEREDITARY FRUCTOSE INTOLERANCE. *(E.)* Schapira, F.; Hatzfeld, A.; Gregori, C. (Univ. Cochin Hosp. Cent., Paris, France). *Enzyme* 18(1/2):73-83, 1974.

0580 THE DIFFERENTIAL DIAGNOSIS OF NEONATAL HEPATITIS AND BILIARY ATRESIA. *(E.)* Campbell, D. P.; Poley, J. R.; Alaupovic, P.; Smith, E. I. (Univ. Oklahoma Health Sci. Cent., Oklahoma City). *J. Pediatr. Surg.* 9(5):699-705, 1974.

0581 NEONATAL AND RECURRENT CHOLESTASIS WITH LYMPHOEDEMA (NORWEGIAN TYPE HEREDITARY CHOLESTASIS). TWO NEW FAMILIES, WITH STUDIES ON BILE ACID METABOLISM AND ELECTRON MICROSCOPY. *(E.)* Aagenaes, O.; Normann, A. (Univ. Hosp. Rikshosp., Oslo, Norway). *Digestion* 10(4/5):332, 1974.

0582 DEFECTIVE METABOLISM OF THIHYDROXYCOPROSTANIC ACID (THCA) TO CHOLIC ACID (CA) IN TWO SIBLINGS WITH A FAMILIAL LIVER DISEASE: AN APPARENT DEFICIENCY OF 24-HYDROXYLASE. *(E.)* Hanson, R. F.; Isenberg, J. N.; Klein, P. D.; Williams, G. C.; Szezepanik, P.; Sharp, H. L. (Dep. Intern. Med., Univ. Minnesota, Minneapolis). *Gastroenterology* 67(4):796, 1974.

0583 DIFFERENTIAL RESPONSE OF SERUM BILIRUBIN AND SERUM BILE ACIDS IN CONSTITUTIONAL HEPATIC DYSFUNCTION (CHD). *(E.)* Robert, Y.; Paumgartner, G.; Preisig, R. (Dep. Clin. Pharmacol., Univ. Bern, Switzerland). *Digestion* 10(4/5):378, 1974.

0584 THE CEREBRAL COPPER-PROTEIN COMPLEXES IN HEPATO-LENTICULAR DEGENERATION STUDIED BY MEANS OF ELECTRON-SPIN-RESONANCE TECHNIQUE. *(E.)* Wender, M.; Adamczewska, Z.; Gruszczynska, U.; Dezor, A. (Inst. Phys., Polish Acad. Sci., Poznan). *Acta Neurol. Scand.* 50(6):812-815, 1974.

0585 IMMUNOLOGICAL STUDIES IN PATIENTS RECEIVING REPEATED ALLOGENEIC AND XENOGENEIC LIVER HEMOPERFUSIONS. *(E.)* Abouna, G. M.; Amemiya, H.; Andres, G.; Porter, K. A.; Hamilton, D. (Univ. Calgary Med. Sch., Canada). *Transplantation* 18(5):395-408, 1974.

0586 A STUDY OF LEVELS OF ORNITHINE CARBAMOYLTRANSFERASE IN 49 TUBERCULOSIS PATIENTS TREATED WITH RIFAMPICIN. *(E.)* Lengrand, J.; Kalachnikoff, P.; Martinez, B.; Rey, J. F.; Delmont, J. (Cimiez Hosp., Nice, France). *Digestion* 10(4/5):363, 1974.

0587 SYNTHESIS OF GLYCOSAMINOGLYCANS (GAG) AND COLLAGEN (C) BY HUMAN LIVER "FIBROBLASTS" IN TISSUE CULTURE. *(E.)* Galambos, J. T.; Hollingsworth, M.; Falek, A. (Emory Univ. Sch. Med., Atlanta, Ga.). *Gastroenterology* 67(4):794, 1974.

0588 STUDIES ON THE NATURE OF HYPERTRIGLYCERIDEMIA IN LIVER DISEASE. *(E.)* Linhart, P.; Seidel, D.; Kommerell, B. (Univ. Heidelberg Med. Clin., Germany). *Digestion* 10(4/5):365, 1974.

0589 ANAEROBIC BACTERIOLOGICAL STUDY OF THE HUMAN LIVER — WITH A CRITICAL REVIEW OF THE LITERATURE. *(E.)* Nielson, M. L.; Justesen, T.; Asnaes, S. (Rigshosp., Copenhagen, Denmark). *Scand. J. Gastroenterol.* 9(7):671-677, 1974.

0590 BILE SALT GLUCURONIDES IN MAN: IDENTIFICATION AND QUANTITATIVE ANALYSIS. *(E.)* Frohling, W.; Stiehl, A. (Med. Clin., Univ. Heidelberg, Germany). *Digestion* 10(4/5):318-319, 1974.

0591 BILE SALT ALKYL ETHERS: EVIDENCE FOR A NEW CLASS OF BILIARY LIPIDS IN HUMAN BILE. *(E.)* Hachey, D. L.; Szcepanik, P. A.; Watkins, J. B.; Tercyak, A. M.; Klein, P. D. (Argonne Natl. Lab., Ill.). *Gastroenterology* 67(4):795, 1974.

See also, 0055, 0156, 0176, 0177, 0194, 0212, 0329, 0339, 0340, 0342, 0367, 0368, 0369, 0370, 0371, 0372, 0373, 0374, 0375, 0376, 0381, 0419, 0593, 0666, 0679, 0688, 0694, 0716, 0738, 0778, 0782, 0797, 0798, 0799.

LIVER AND BILIARY TRACT

Hyperbilirubinemic States

0592 GILBERT'S SYNDROME IN PATIENTS WITH GALLBLADDER STONES. *(E.)* Peel, A. L. G.; Ritchie, H. D. (London Hosp., England). *Ann. R. Coll. Surg. Engl.* 55(4):184-189, 1974.

Gilbert's syndrome was diagnosed in 2 male patients (38 and 42 yr old) out of an unselected group of 247 cholelithiasis patients (63 males and 184 females). From these data it would appear that less than 1% of patients with gallbladder stones also have Gilbert's syndrome. However, when males alone are considered, the overall incidence was 3.2% with 95% confidence limits. Thus, about 1 in every 30 men with cholelithiasis may also have Gilbert's syndrome. It is suggested that the clinician be obligated to perform liver function tests on at least 2 occasions prior to cholecystectomy in male patients with cholelithiasis in an attempt to detect Gilbert's disease and avoid unnecessary bile duct surgery.

0593 ASSOCIATION BETWEEN HYPOURICAEMIA AND JAUNDICE. *(E.)* Schlosstein, L.; Kippen, I.; Bluestone, R.; Whitehouse, M. W.; Klinenberg, J. R. (Wadsworth VA Hosp. Cent., Los Angeles, Calif.). *Ann. Rheum. Dis.* 33(4):308-312, 1974.

Of 4148 patients screened during a 1-yr period, 22 (0.5%) had confirmed plasma urate levels below 2.2 mg/100 ml. Five of the 15 hypouricemic patients whose records were available for study had liver cirrhosis and jaundice. To determine whether the apparent association between hypouricemia and hyperbilirubinemia was a real one, the relation between plasma urate and bilirubin was studied in 5 transiently jaundiced patients during their acute illness and later after complete or partial recovery. The mean serum bilirubin fell from 11.1 to 2.3 mg/100 ml as the patients recovered. This was accompanied by: (1) a rise in mean serum urate from 4.6 to 5.8 mg/100 ml; (2) a mean decrease in renal urate clearance of 3.2 ml/min; (3) a mean increase of plasma urate binding *in vitro* of 0.2 μg urate bound/mg albumin. Thus, the hypouricemia associated with hyperbilirubinemia may be effected in part by increased urate clearance. This increased urate clearance may be caused by bilirubin acting as a uricosuric agent. Further support for the relation between jaundice and impaired urate binding capacity was obtained from animal studies. In rats made icteric by bile duct ligation, urate binding to plasma proteins was completely abolished 20 hr after surgery.

0594 TOTAL SERUM BILE PIGMENT IN JAUNDICES OF VARIOUS ETIOLOGIES. *(Ger.)* Teichmann, W.; Jahn, H. (Med. Clin., Univ. Rostock, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 33(4/5):163-166, 1973.

Results of the comparative determination of the total bile pigment and bilirubin levels in sera from 208 patients with viral hepatitis and 30 patients with extrahepatic obstructive jaundice are presented. The bilirubin level measured in patients with viral hepatitis ranged from 0.27 to 24.45 mg/100 ml, showing a difference of 0 to 2.75 mg/100 ml from the total bile pigment level. The serum bilirubin level in patients with obstructive jaundice ranged from 2.11 to 49.59 mg/100 ml, showing a difference of 0.05-5.60 mg/100 ml from the total bile pigment level. The difference is due to biliverdine and other pigments, which indicates that biliverdine is present in both viral hepatitis and obstructive jaundice. Therefore, the separate determination of the pigments is unsuitable for the differential diagnosis of viral hepatitis and obstructive jaundice. The absence of biliverdine in the serum in hemolytic jaundice indicates that conjugated bilirubin is oxidized much more easily than non-conjugated bilirubin.

0595 DIFFERENTIAL DIAGNOSIS OF JAUNDICE. *(Dut.)* Fevery, J. (St. Rafael Gen. Hosp., Louvain, Belgium). *Tijdschr. Geneesk.* 29(14):677-679, 1973.

0596 NEONATAL NONHEMOLYTIC JAUNDICE. *(E.)* Johnson, J. D. (Stanford Univ. Sch. Med., Calif.). *N. Engl. J. Med.* 292(4):194-197, 1975.

0597 BEHAVIOUR OF HEPATIC GLUCURONYL-TRANSFERASE ACTIVITY IN CHOLESTASIS AND OTHER DISEASES. *(E.)* Mazzanti, R.; Nassi, P.; Arcangeli, A.; Chiarantini, E.; Gentilini, P. (Dep. Intern. Med., Univ. Florence, Italy). *Digestion* 10(4/5):367-368, 1974.

0598 RECENT FINDINGS ON KERNICTERUS. *(It.)* De Toni, E.; Serra, G.; Lazzaroni, F. (L. Gaslini Inst. Pediatr., Univ. Genoa, Italy). *Rassegna Clin. Sci.* 49(4/5):119-124, 1973.

See also, 0124, 0166, 0167, 0377, 0571, 0676.

LIVER AND BILIARY TRACT

Nonviral Hepatitis and Hepatic Injury

0599 PELIOSIS HEPATIS ASSOCIATED WITH ANDROGENIC-ANABOLIC STEROID THERAPY: A SEVERE FORM OF HEPATIC INJURY. *(E.)* Bagheri, S. A.; Boyer, J. L. (Dep. Med., Univ. Chicago, Ill.). *Ann. Intern. Med.* 81(5):610-618, 1974.

Blood-filled cysts, charcteristic of peliosis hepatis, developed within hepatic parenchyma in 7 patients (5 men and 2 women, ages 20-67 yr) who were treated with androgenic-anabolic steroids for periods ranging from 2-27 months. Androgenic steroids were administered to 5 patients as hematopoietic agents to stimulate hypoplastic bone marrows, while the steroids were given as androgenic or anabolic drugs to 2 patients with malignancy. The agents used included testosterone enanthate, testosterone propionate, fluoxymesterone, methyltestosterone, norethandrolone, and oxymetholone. Although liver function was normal in all patients before therapy was started, all but 1 patient developed hepatomegaly or signs of hepatic toxicity following therapy. Two patients sustained intraperitoneal hemorrhages from the peliotic lesions, and 1 died from shock. Peliosis hepatis was a coincidental finding at autopsy in 3 of the patients who died from pulmonary alveolar proteinosis, Hodgkin's disease, and metastatic thymoma. Peliosis also seemed to contribute to the death of a patient in whom wide-spread breast cancer was found. Histologic examination suggested that the hemorrhagic cysts observed in the patients developed from focuses of hepatocellular necrosis. The findings indicate that peliosis hepatis can be a serious life-threatening complication of androgenic-anabolic steroid therapy in man.

0600 DISULFIRAM HYPERSENSITIVITY HEPATITIS. *(E.)* Keeffe, E. B.; Smith, F. W. (Portland VA Hosp., Oregon). *JAMA* 230(3):435-436, 1974.

A case of disulfiram-induced acute hepatitis is reported for a 44-yr-old male receiving the drug during treatment for chronic alcoholism and multiple drug abuse. Disulfiram therapy (0.5 g daily for 5 days, then 0.25 g daily) had been initiated after 3 months of sobriety. After 10 days of therapy, the patient rapidly developed fatigue, malaise, and jaundice without fever. Disulfiram treatment was promptly stopped as was treatment with chlordiazepoxide hydrochloride and methylphenidate hydrochloride, both of which he had been taking for many months. The patient denied alcohol or other drug ingestion and knew of no exposure to hepatitis. The bilirubin value peaked at 6.9 mg/100 ml and the SGOT reading at 2040 U, with only a slight elevation in serum alkaline phosphatase level. Testing for hepatitis-associated antigen was negative. After 3 weeks of discontinuation of the drug, the patient felt well and liver function tests returned to normal. Ten days after resumption of disulfiram (0.25 g daily) therapy, the same biochemical and clinical sequelae returned. Different factors on this occasion included the presence of urticaria for 2 days and the absence of treatment with other medications. Again, the patient's condition improved rapidly after therapy with the drug was stopped. A liver biopsy specimen taken after the 2nd interruption in drug therapy was minimally abnormal, with mild cytoplasmic degeneration of hepatic cells, increased hepatocellular regeneration, and minimal focal histiocytic reaction. The patient was diagnosed as having probable disulfiram-induced hepatitis. The routine use of transaminase determinations before and after initiation of disulfiram therapy is suggested for detecting further cases of drug-induced hepatitis, particularly of the mild or anicteric variety.

0601 GRANULOMATOUS HEPATITIS DUE TO Strongyloides stercoralis. *(E.)* Poltera, A. A.; Katsimbura, N. (Dep. Pathol., Makerere Univ., Kampala, Uganda). *J. Pathol.* 113(4):241-246, 1974.

Autopsies were performed on 5 patients (2-45 yr old) who were infested with *Strongyloides stercoralis*. Serial sections of the available liver blocks were examined and special iron and reticulin stains were prepared. The *S. stercoralis* larvae had infiltrated the portal tracts and lobules in all 5 cases and in 1 case they were found in the portal vein branches. Cellular reaction was not always present. The number of larvae counted varied, the maximum being 13 in a 2 x 1 cm slide. Granuloma formation with or without larvae was observed in all cases, moderate diffuse fatty changes in the hepatocytes were noted in 4, cholestasis was present in 3 and several mitotic figures were observed in the liver cells of 2 of the patients. Four of the cases also had malaria, microfilaria or *S. mansoni* infestations. *Strongyloides stercoralis* should always be considered a possible cause in all cases of granulomatous hepatitis of obscure origin.

See also, 0145, 0150, 0378, 0444, 0783, 0796.

LIVER AND BILIARY TRACT

Acute Viral Hepatitis

0602 HEPATITIS — A VIRUS-INDUCED AUTOIMMUNE DISEASE. *(Ger.)* Berthold, H. (Med. Virol., Univ. Freiburg, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:637-639, 1973.

Adsorption tests with human fibroblasts and hepatitis serum, carried out by immunofluorescence, frequently revealed anticellular antibodies against human cells, e.g., of immunoglobulin G type. Changes caused by viral proliferation in the nuclear antigenicity can be also assumed to condition a change in the superficial antigenicity in hepatitis, in analogy to the SV 40 model. The immunologically altered cell is eliminated by the immune system as a foreign cell, in cooperation with the cellular immune reaction. This process of the immunological elimination of virus-infected cells is proposed to be termed as a virus-induced autoimmune process in connection with acute viral hepatitis.

0603 CELLULAR IMMUNE REACTIONS AGAINST THE HEPATITIS-ASSOCIATED ANTIGEN (HAA) AND THE HOMOLOGOUS LIVER-SPECIFIC ANTIGEN (HLP) IN ACUTE HAA-POSITIVE HEPATITIS. *(Ger.)* Knolle, J.; Meyer zum Buschenfelde, K. H.; Friedrichs, N.; Bolte, J. P. (Med. Clin. II, Univ. Mainz, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:639-641, 1973.

Cellular immune reactions against the hepatitis-associated antigen (HAA) and the homologous liver-specific antigen (HLP) were studied by Thor's modified leukocyte migration inhibition tests in acute HAA-positive hepatitis. Between the 3rd and 8th weeks of the disease, 46 cases of acute hepatitis were tested with HLP, and 51 with acute hepatitis with HAA-positive serum. In addition, 15 cases of cured hepatitis and 9 with chronic persistent hepatitis were investigated with HLP. Tests with HLP as an antigen revealed migration inhibition in 7 of 31 patients HAA-negative during the observation period. Similar findings were obtained for 3 out of 15 patients who remained HAA-positive. Inhibition was observed in 2 out of 15 patients with clinically cured hepatitis, and in 1 out of 9 patients with chronic persistent hepatitis. The findings indicate a possible virus-induced breakthrough of the tolerance against hepatic antigens. Acute hepatitis HAA-negative between the 3rd and 8th weeks of the disease showed inhibition of the migration in 20 of 33 cases, and stimulation in 5 of the 33 cases in the HAA test. Ten of the 18 persistent antigen carriers showed neither inhibition nor stimulation. Simultaneous inhibition of leukocyte migration in both the HLP and HAA tests was detected in 6 of the 51 cases, which indicates independent cellular immune reactions against HLP and HAA. Cellular immune reaction against HAA occurred most frequently in cases in which the antigen disappeared during the observation period. It is concluded that cellular immune reactions against hepatic antigens are indicative of a virus-induced autoimmune reaction.

0604 RELATIONSHIPS BETWEEN INTESTINAL ALKALINE PHOSPHATASE ISOENZYME LEVELS IN BLOOD AND THE LENGTH OF THE COURSE OF VIRAL HEPATITIS. *(Fr.)* Gabrielle, L.; Leterrier, F.; Calba-Faguer, A.; Cristau, P.; Essioux, H.; Molinie, C.; Laverdant, C. (Res. Cent., Army Health Serv., Clamart, France). *Biol. Gastroenterol. (Paris)* 7(2):111-115, 1974.

The relation between the duration of viral hepatitis and serum levels of alkaline phosphatase isoenzyme of intestinal origin was studied. Based on the fact that 5 mM L-phenylalanine caused 10% inhibition of the bone and liver alkaline phosphatase isoenzymes and 60% inhibition of intestinal alkaline phosphatase, the following formula for "y", the serum level of intestinal enzyme, was derived: $y = 2(.9T - t)$ where T and t are the total activity of alkaline phosphatase before and after inhibition by L-phenylalanine, resp. Of 62 male hepatitis patients in their twenties, the 21 who had hepatitis for more than 2 months had significantly higher levels of intestinal alkaline phosphatase measured in the first 15 days of illness than the 41 who recovered within 2 months. There was no significant difference between these groups in the level of total or bone + liver alkaline phosphatase. In a control group of 60 healthy male patients in their twenties (30 of blood type O and 30 of blood type A), intestinal alkaline phosphatase was significantly higher in those with blood type O. This difference between the 2 blood types was not seen in the 44 hepatitis patients who were typed (23-O, 21-A).

0605 EPINEPHRINE-INDUCED GLYCOGENOLYSIS AND LYPOLYSIS IN INFECTIOUS HEPATITIS. II. NONESTERIFIED FATTY ACIDS AND THEIR RELATION TO IMPAIRED SUGAR UTILIZATION. *(Cz.)* Holik, K.; Rysanek, K.; Parak, S.; Prajsova, R. (Fac. Med., J. E. Purkyne Univ., Brno, Czechoslovakia). *Vnitr. Lek.* 19(1):49-54, 1973.

Fasting plasma nonesterified fatty acid (NEFA) levels were measured in blood taken from 10 patients with viral hepatitis and 14 normal controls 30, 60, 120, and 180 min after administration of 0.01 mg/kg epinephrine. Initial NEFA levels in patients with viral hepatitis were twice as high (0.480 mEq/liter) as those in controls (0.240 mEq/liter). Significant increases in plasma NEFA levels occurred in both controls and patients with viral hepatitis after administration of epinephrine, but increases were greater in patients with viral hepatitis than in controls. In both groups NEFA levels decreased rapidly from 60 min after epinephrine injections, and initial levels were reached after 120 min. These findings indicate that larger quantities of NEFA are mobilized from adipose tissue in patients with viral hepatitis and that this liberated NEFA is utilized rapidly. In a previous paper it was demonstrated that carbohydrate metabolism was impaired, insulin resistance increased, and the rate of gluconeogenesis increased in patients with viral hepatitis. These findings are similar to those of "fatty acid syndrome" described by Randle *et al.* in patients with diabetes, acromegaly, Cushing's syndrome, and starvation. Impairment of carbohydrate utilization causes this syndrome in liver disease.

0606 SUPPRESSION BY PREGNANCY AND BIRTH CONTROL PILLS (BCP) OF THE RISE IN SERUM GAMMA GLUTAMYL TRANSPEPTIDASE (GGT) IN VIRAL HEPATITIS. *(E.)* Combes, B.; Shore, G. M.; Cunningham, F. G.; Walker, F. B.; Shorey, J.; Ware, A. (Univ. Texas Southwest. Med. Sch., Dallas). *Gastroenterology* 67(4):A-784, 1974.

Serum gamma glutamyl transpeptidase (GGT) activity was compared in pregnant and nonpregnant women with viral hepatitis. Serum GGT was increased in the majority of women with viral hepatitis occurring in the first half of pregnancy. By contrast, in the second half of gestation GGT values were relatively depressed even though hepatitis was as severe. Mean GGT activity was lower, and abnormal values were less frequent in nonpregnant women with viral hepatitis who were taking birth control pills. It is suggested that estrogens and/or progestational compounds affect liver such that less GGT is released into blood with acute hepatocellular injury, and that GGT assays have impaired diagnostic value in persons exposed to estrogens and/or progestogens.

0607 HEPATIC CIRCULATION IN HEPATITIS A: A STUDY IN YOUNG MALES AT REST AND DURING AND AFTER SUPINE LEG EXERCISE. *(E.)* Lundbergh, P. (Roslagstull Hosp., Stockholm, Sweden). *Acta Med. Scand.* [*Suppl.*] (562):56pp, 1974.

The hepatic circulation of 10 male hepatitis A patients and 17 healthy male volunteers (age 20-30 yr) was studied by hepatic venous catheterization in the supine position at rest and during two 20-min periods of supine leg exercise and for 30 min thereafter. At rest in the supine position the patients had significantly higher values than the controls for total hepatic blood flow (2.21 liters/min *versus* 1.44 liters/min), for splanchnic oxygen uptake (79.7 ml/min *versus* 60.9 ml/min), for the difference between wedged and free hepatic venous pressure (2.9 mmHg *versus* 0.9 mmHg), and for estimated hepatic fat content (5.8% *versus* 3.6%). During exercise (10 patients and 13 controls), total hepatic blood flow decreased in both groups by about 0.8 liters/min. When the reduced hepatic blood flow during exercise was expressed as percent of the value at rest, the patients and the controls had the same flow reduction and increase in splanchnic flow resistance in relation to the increase in heart rate as a measure of the relative work load. Arteriohepatic venous oxygen difference during exercise was lower in patients than in controls. No negative effects of the exercise were seen in the 8 patients with values for serum bilirubin below 4 mg/100 ml but were noted in the two remaining patients with serum bilirubin values of 9.6 mg/100 ml and 5.8 mg/100 ml, resp. A probable explanation of the high hepatic blood flow seen in the acute stage of hepatitis A might be that, because of the uneven distribution of the hepatic cellular changes, local circulation is unevenly impaired and anoxia develops in some areas with a resultant metabolic vasodilatation. It is concluded that the changes observed in the circulation during the acute stage of hepatitis A are attributable to the disease, that they are reversible, and that strenuous physical exercise should be avoided until the serum bilirubin is below 4 mg/100 ml.

0608 LONG TERM FOLLOW-UP STUDIES OF PATIENTS SURVIVING FULMINANT VIRAL HEPATITIS. *(E.)*

Karvountzis, G. G.; Redeker, A. G.; Peters, R. L. (Univ. South. California Sch. Med., Los Angeles). *Gastroenterology* 67(5):870-877, 1974.

Long term follow-up studies (3 to 46 months) were conducted in 22 patients (15 to 34 yr) who had survived acute viral hepatitis with coma. The epidemiological background included the self-injection of drugs in 13 cases, no obvious source for the infection in 8 patients, and blood transfusion 3 months before jaundice in 1 patient. Complete clinical and biochemical resolution of the hepatitis was observed in all patients within 45 to 75 days after the onset of the acute hepatitis. The only identifiable sequela of the fulminant episode was the persistence of hepatitis B antigen (HB Ag) in 1 of 16 initially HB Ag-positive patients. Three patients suffered a second attack of acute viral hepatitis 4 to 10 months after recovery from the fulminant episode. All 3 patients had continued the use of illicit drugs. Mild unresolved hepatitis followed the second episode in 1 patient. Follow-up liver biopsy in 13 patients (2-37 months after the fulminant episode) showed no liver disease related to the fulminant hepatitis except for the mild unresolved hepatitis in the HB Ag carrier. It appears that patients who survive fulminant viral hepatitis rarely develop chronic liver disease, in spite of the extreme degrees of hepatic necrosis occurring during the acute illness.

0609 HEPATITIS B INFECTION: A POINT-PREVALENCE STUDY IN 15 US HEMODIALYSIS CENTERS. *(E.)*

Szmuness, W.; Prince, A. M.; Grady, G. F.; Mann, M. K.; Levine, R. W.; Friedman, E. A.; Jacobs, M. J.; Josephson, A.; Ribot, S.; Shapiro, F. L.; Stenzel, K. H.; Suki, W. N.; Vyas, G. (New York Blood Cent., N.Y.). *JAMA* 227(8):901-906, 1974.

Five hundred eighty-three patients and 451 medical personnel of 15 hemodialysis centers in six states, representing a broad cross-section of facilities during 1972-1973, were surveyed for hepatitis B infections. In addition to the patients and medical personnel, serum specimens were obtained from 156 family contacts of 68 dialysis patients; 247 family contacts of 107 hepatitis B antigen (HB Ag)-negative volunteer blood donors served as controls. Serum samples were tested for HB antigen by agar gel diffusion and radioimmunoassay; for hepatitis B antibody (HB Ab) by passive hemagglutination; and for SGPT activity by the kinetic spectrophotometric technique. Epidemiologic data on patients, staff, and family contacts were gathered by personal interview and medical records. HB Ag was detected in 16.8% of the patients and in 2.4% of the medical staff; HB Ab was detected in 34.0% and 31.3%, resp. The cumulative prevalence of HB Ag and HB Ab varied widely among the centers. The prevalence of HB Ag and HB Ab in patients was related to duration of dialysis treatment, but not to blood transfusions. Significant differences in prevalence of serologic indicators of hepatitis B infection among various staff categories were not observed. Sixty-one % of the family contacts of dialysis patients with a history of hepatitis B infection were found to have HB Ag or HB Ab.

0610 ARTHRITIS IN ACUTE HEPATITIS AND CHRONIC ACTIVE HEPATITIS: PATHOLOGY OF THE SYNOVIAL MEMBRANE WITH EVIDENCE FOR THE PRESENCE OF AUSTRALIA ANTIGEN IN SYNOVIAL MEMBRANES. *(E.)*

Schumacher, H. R.; Gall, E. P. (VA Hosp., Philadelphia, Pa.). *Am. J. Med.* 57(4):655-664, 1974.

Arthritis seen in the prodrome of acute viral hepatitis and as an early manifestation of chronic active hepatitis was studied in two patients using light and electron microscopic findings of needle synovial biopsy specimens. Both patients had very low levels of serum complement and circulating Australia antigen, suggesting the possible mechanism of immune complex deposition in some tissue injury. The synovial effusion in acute hepatitis was inflammatory, but neither synovial membrane showed more than rare inflammatory cells. Evidence for Australia antigen in the synovium was obtained by direct immunofluorescence and by electron microscopic identification of 200 to 250 Å and 400 to 600 Å particles in vessel endothelium, synovial lining cells and other deep synovial cells. Cell injury in synovial cells containing virus-like particles suggests that a direct virus effect on the synovium may be the mechanism for the production of arthritis.

0611 VIRAL HEPATITIS B AND PERIARTERITIS NODOSA. *(Fr.)*

Trepo, C.; Thivolet, J.; Girard, M. (Red Cross Hosp., Lyon, France). *J. Med. Lyon* 54(1240):17-26, 1973.

Various reported observations indicate that the Australia antigen of hepatitis B (HB Ag) is associated with periarteritis nodosa in 1 case out of 3, but the antigen appears to be absent in other cases of vascularitis. The authors observed 24 cases of HB Ag associated with periarteritis nodosa. The antigen appeared early in the course of the disease in most instances, and in all but 3 of the cases the antigen persisted for as much as 2 years. The relation between the hepatitis virus and the disease is confirmed by the appearance of viral hepatitis at the beginning of the disease in 70% of the cases. In most cases the transaminases normalized in spite of the persistance of the antigen, especially when treated with cortisone. Thus the group of patients studied was distinguished clinically by the frequency of hepatic involvement and rarity of pulmonary

ymptoms, and pathologically by the presence of HB
g and absence of antinuclear antibodies and rheuma-
oid factors. These facts and the existence of
ontamination by the hepatitis virus preceding ap-
earance of any symptoms in 15 cases shows that this
s not a matter of a secondary infection favored by
n immunological deficiency. Rather, it seems likely
hat the hepatitis virus plays a role in the etio-
ogy of periarteritis nodosa, a conclusion which is
upported by some previous clinical, epidemiological,
nd animal studies. The hepatitis inaugurates the
ourse of disease, but it may recede while the dis-
ase continues to evolve; this suggests that the en-
endering mechanisms of the 2 diseases are quite dis-
inct. The factors which favor the development of
eriarteritis nodosa pursuant to hepatitis are un-
nown. Furthermore, since neither the antigen nor
he antibody of HB Ag can be detected in some cases
f periarteritis nodosa, it seems probable that
hronic infection of hepatitis virus B constitutes
nly one of several etiologies of periarteritis no-
osa.

612 JAUNDICE AND HEPATITIS B ANTIGEN/ANTIBODY
IN HEMOPHILIA. *(E.)* Lewis, J. H.; Maxwell,
. G.; Brandon, J. M. (Dep. Med., Univ. Pittsburgh,
a.). *Transfusion* 14(3):203-211, 1974.

he incidence of hepatitis as well as the occurrence
f jaundice and of hepatitis B antigen/antibody in
ver 1000 stored and fresh serum samples were stu-
ied in 375 hemophiliacs. Patients at highest risk
ere those who had received fractions prepared from
ooled plasma (22%). Concentrates of factor IX were
ssociated with hepatitis about 3 times as often as
ere factor VIII fractions. Acute phase serum was
vailable from 12 of 14 hepatitis patients treated
ith factor VIII and 8 of 10 treated with factor IX
oncentrates. Of these, 2 of the samples from factor
III deficient patients and 7 of the sera from factor
X deficient patients were positive for hepatitis B
ntigen. Antibody was detected in 6 factor VIII and
factor IX deficient sera. Multiple serum samples
ere available from 89 patients without overt hepa-
itis but who had received fraction therapy. Hepa-
itis B antigens were detected in 1 hemophiliac and
afibrinogenemic. Antibody was found in 24% of the
actor VIII and 17% of the factor IX deficient pa-
ients. Positive antibody titers usually appeared
ollowing therapy with plasma fractions and decreased
r disappeared during clinically quiescent periods.
f the 113 patients who received plasma fraction
herapy, 66 (58%) did not develop overt hepatitis or
irculating hepatitis B antigen/antibody.

613 CELL-MEDIATED IMMUNITY TO HEPATITIS B ANTI-
GEN AND TO LIVER-SPECIFIC ANTIGEN IN ACUTE
IRAL HEPATITIS TYPE B. *(E.)* Lee, W. M.; Mitchell,
. G.; Reed, W. D.; Vahrman, J.; Zuckerman, A. J.;
ddleston, A. L. W. F.; Williams, R. (Kings Coll.
osp. Med. Sch., London). *Gastroenterology* 67(4):
07, 1974.

614 IMMUNOGLOBULINS IN ACUTE HEPATITIS. *(Ger.)*
Stiess, G.; Berthold, H. (Dep. Res. Med. Virol., Univ. Freiburg, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:635-637, 1973.

0615 LYMPHOCYTE STIMULATION BY SUBTYPES OF HB$_S$AG. *(E.)* de Gast, G. C.; Houwen, B.; Que, G. S.; Nieweg, H. O. (Dep. Med., Univ. Groningen, Netherlands). *Digestion* 10(4/5):327, 1974.

0616 PLASMA LIPIDS AND LIPOPROTEIN CHANGES IN ACUTE VIRAL HEPATITIS. *(E.)* Pearson, A. J. G.; Pyrovalakis, J.; McIntyre, N. (R. Free Hosp., London, England). *Digestion* 10(4/5):322, 1974.

0617 A STUDY ON HEPATIC ENZYME INDUCTION DURING HUMAN ACUTE VIRAL HEPATITIS. *(E.)* Carrella, M.; Budillon, G.; Mazzacca, G.; De Ritis, F. (Inst. Clin. Med., Univ. Naples, Italy). *Digestion* 10(4/5): 341, 1974.

0618 CELLULAR IMMUNE REACTIONS IN THE COURSE OF VIRUS HEPATITIS. *(E.)* Sodomann, C. P.; Havemann, K.; Martini, G. A. (Med. Clin., Univ. Marburg/Lahn, Germany). *Digestion* 10(4/5):328-329, 1974.

0619 INTRAHEPATIC LOCALIZATION OF HEPATITIS B ANTIGEN (HBAg) BY IMMUNOFLUORESCENCE IN 275 LIVER BIOPSIES. *(E.)* Sanchez-Cuenca, J. M.; Roderigo-Moreno, M.; Rayon, M.; Gonzales-Molina, A.; Sarrion, J.; Marty, M. L.; Berenguer, J.; Baguena, J. (La Fe City Sanit. Soc. Secur., Valencia, Spain). *Digestion* 10(4/5):379-380, 1974.

0620 IMMUNOFLUORESCENCE AND ELECTRON MICROSCOPIC STUDY OF THE HEPATITIS B "CORE" ANTIGEN IN THE LIVER. *(E.)* Hadziyannis, H.; Gerber, M. A. (Athens Univ. Hippokration Gen. Hosp., Greece). *Gastroenterology* 67(4):795, 1974.

0621 BLEEDING DISORDER IN AN INFANT ASSOCIATED WITH ANICTERIC HEPATITIS. ACQUIRED PROTHROMBIN DEFICIENCY. *(E.)* Poley, J. R.; Humphrey, G. B. (Child. Mem. Hosp., Oklahoma City, Okla.). *Clin. Pediatr.* 13(12):1045-1047, 1974.

0622 SUBACUTE HEPATIC NECROSIS IN ACUTE HEPATITIS. *(E.)* Ware, A. J.; Eigenbrodt, E.; Combes, B. (Univ. Texas Southwest. Med. Sch., Dallas). *Gastroenterology* 67(4):835, 1974.

0623 HEPATITIS B IN PLASMA FRACTIONATION WORKERS. A SEROEPIDEMIOLOGIC STUDY. *(E.)* Taylor, J. S.; Shmunes, E.; Holmes, A. W. (Public Health Serv., Cincinnati, Ohio). *JAMA* 230(6):850-853, 1974.

0624 HEPATITIS-B IN AN ONCOLOGY UNIT. *(E.)* Wands, Wands, J. R.; Walker, J. A.; Davis, T. T.; Owens, A. H.; Carpenter, C. C. J. (Johns Hopkins Univ. Sch. Med., Baltimore, Md.). *Gastroenterology* 67(4): 834, 1974.

0625 LIVER DISEASE IN CHRONIC CARRIERS OF HEPATITIS B ANTIGEN (HBAg): HISTOLOGICAL FINDINGS IN 29 HEALTHY BLOOD DONORS. *(E.)* Villeneuve, J. P.; Cote, J.; Richer, G.; Guevin, R.; Marleau, D.; Joly, J. G.; Viallet, A. (St. Luke Hosp., Montreal, Canada). *Gastroenterology* 67(4):833, 1974.

0626 INTRAFAMILIAL SPREAD OF THE HEPATITIS B VIRUS. *(E.)* Hadziyannis, S. (Athens Univ. Med. Sch., Greece). *Digestion* 10(4/5):353, 1974.

0627 IMMUNOLOGICAL STUDIES ON LIVER DISEASE IN THE MONGOLIAN PEOPLE'S REPUBLIC. *(E.)* Akhmeteli, M. A.; Vasil'eva, V. I.; Dordzgotov, N.; Namdava, N.; Cernov, K. S.; Sipaceva, N. B. (World Health Organ., Geneva, Switzerland). *Bull. WHO* 50(5):407-411, 1974.

0628 FAMILIAL CLUSTERING OF HEPATITIS B SURFACE ANTIGEN AMONG PANAMANIAN INDIANS. *(E.)* Reeves, W. C.; Peters, C. J.; Moon, T. E.; Purcell, R. H. (Gorgas Mem. Inst. Trop. Prev. Med., Balboa Heights Canal Zone). *J. Infect. Dis.* 131(1):67-70, 1975.

0629 ACUTE AND CHRONIC POST TRANSFUSION HEPATITIS *(E.)* Koretz, R. L.; Damus, K.; Ritman, S.; Arthur, M.; Kash, P.; Golub, L.; Rebhun, D.; Gitnick, G. L. (Univ. California, Los Angeles). *Gastroenterology* 67(4):804, 1974.

0630 CURRENT PROBLEMS OF VIRAL HEPATITIS. *(It.)* Ricci, G. (Clin. Infect. Dis. I, Univ. Rome, Italy). *Rassegna Clin. Sci.* 49(3):73, 76, 1973.

0631 HEPATITIS. *(Fl.)* De Groote, J. (St. Rafael Gen. Hosp., Louvain, Belgium). *Tijdschr. Geneesk.* 29(14):680-686, 1973.

See also, 0379, 0594, 0636, 0684.

LIVER AND BILIARY TRACT

Chronic Hepatitis

0632 CHRONIC SEPTAL HEPATITIS. *(E.)* Gerber, M. A.; Vernace, S. (Mt. Sinai Sch. Med., City Univ. New York, N.Y.). *Virchows Arch.* [*Pathol. Anat.*] 363(4):303-309, 1974.

A type of chronic hepatitis designated as chronic septal hepatitis was distinguished morphologically from chronic aggressive and chronic persistent hepatitis in 18 of 200 biopsy specimens from patients with chronic hepatitis. The 18 specimens showed chronic portal inflammation without erosion of the limiting plate but with formation of fibrous septa. The portal tracts were moderately enlarged and infiltrated predominantly by lymphocytes mixed with plasma cells and macrophages. The inflammatory cells did not extend into the adjacent liver parenchyma, and the limiting plate was intact. There was little bile ductular proliferation and no ductal destruction. Fibrous septa of various lengths extended from the portal tracts into the parenchyma but only rarely reached the central veins or adjacent portal tracts. Clinically, many patients were asymptomatic despite hepatomegaly and elevated serum transaminase activities, while immune markers were usually absent from the serum. Chronic septal hepatitis was often seen after corticosteroid therapy of chronic aggressive hepatitis, though it also occurred *de novo*. Transition to cirrhosis was not observed during follow-ups (2 months to 5 yr) except in 1 case with high serum γ-globulin. Until the etiology of different types of chronic hepatitis is firmly established, classification will have to be based on clinical manifestations or morphologic criteria.

0633 CHRONIC LOBULAR HEPATITIS. *(Fr.)* Gardiol, D.; Rivier, E. (Cantonal Hosp., Lausanne, Switzerland). *Schweiz. Med. Wochenschr.* 104(41): 1450-1453, 1974.

Out of 9600 reviewed liver biopsies, 21 cases were found to conform to the recently fixed description of chronic lobular hepatitis: a process that continues for at least 3 months and presents a clinical picture of acute viral hepatitis, with disseminated hepatocyte necrosis in the hepatic lobe. The 21 cases were submitted to a systematic histological analysis. The most significant histologic sign for the diagnosis is the disseminated hepatocyte necrosis Associated with this must be a diffuse kupfferian reaction and portal inflammatory infiltration. The criterion of chronicity is not demonstrated by any histologic signs, but 85% of the biopsies were done between the 4th and 6th months in the evolution of the disease. In 10 cases, it was possible to follow the evolution of the disease through more than one biopsy. It was found that after an interval of some months the lesions tended to recede, and in all but one case, biopsies taken more than a year after the initial episode of the disease showed more complete regression of the necrosis process. Chronic lobular hepatitis is distinguished from protracted hepatitis by more marked portal fibrosis and collagenization of the reticuline fibers, by less frequent cholestasis, and by less diversified hepatic involvement. It is distinguished from classic chronic hepatitis by greater hepatocyte necrosis. However, the term used to designate the disease is not satisfactory.

0634 CHRONIC FOCALIZED GLOMERULITIS AND CHRONIC PERSISTENT HEPATITIS FOLLOWING KIDNEY

TRANSPLANTATION: DETECTION OF HEPATITIS-B- AND EPSTEIN-BARR VIRUS ANTIGENS. *(Ger.)* Sonnabend, W.; Kistler, G. S.; Thiel, G.; Zollinger, H. U.; Bianchi, L.; Enderlin, F.; Gudat, F.; Krech, U. (Inst. Pathol., Univ. Basel, Switzerland). *Schweiz. Med. Wochenschr.* 104(35):1205-1217, 1974.

A kidney transplant recipient with primary chronic glomerulonephritis, investigated after an unclear rejection episode, was found to have chronic persistent B hepatitis and a chronic Epstein-Barr virus (EBV) infection. Hepatitis B antigen and EBV antigen were detected by immunofluorescence in the glomerular basal membranes of the transplant. The glomerula displayed intramembranous and subepithelial electron-dense deposits containing numerous small clusters of round particles measuring 20-30 nm and 100 nm, resp. The small particles are assumed to represent complexed HB_s-Ag, whereas the large particles are believed to represent nucleocapsids of EBV. Three later biopsies showed the development of a finally diffuse membrano-proliferative glomerulonephritis. Several episodes of increased proteinuria, which were paralleled by an increase in EVB antibody titer, point to a possible causal relationship between transient deterioration of the transplant function and the activation of the viral infection. The data thus support the findings of other investigators who postulate that even mild viral, bacterial and fungal infections may trigger the rejection of a renal allograft. The presence of HB Ag in serum samples taken between the first and 4th weeks post operation, a transient disappearance, and subsequent appearance indicate the possible presence of hepatitis B virus in the blood used for transfusion, and endogenous synthesis of HB Ag during the later course of the follow-up study.

0635 ASYMPTOMATIC LIVER DISEASE IN HEPATITIS B ANTIGEN CARRIERS. *(E.)* Woolf, I. L.; Boyes, B. E.; Jones, D. M.; Whittaker, J. S.; Tapp, F.; MacSween, R. N. M.; Renton, P. H.; Stratton, F.; Dymock, I. W. (Univ. Hosp. South Manchester, England). *J. Clin. Pathol.* 27(5):348-352, 1974.

Thirty-four healthy blood donors (25 male and 9 female, mean age of 33.6 yr), found to be persistent hepatitis B antigen carriers, were investigated by means of serial liver function tests, BSP retention, and liver biopsy. A history of possible exposure to the antigen was elicited in 19 of the donors. The only clinical abnormality was minor hepatomegaly which was present in 3 donors. Histological abnormalities were observed in 31 of the donors and included 1 case of cirrhosis, 3 cases of chronic aggressive hepatitis, and 11 cases of chronic persistent hepatitis. Focal areas of necrosis in the liver parenchyma were observed in 13 biopsies. Abnormal liver function (SGOT over 40 Karmen U or serum globulin greater than 3.5 g/100 ml) was detected in 18 of the donors, including 7 of 11 donors with chronic persistent hepatitis, 1 with cirrhosis, and all 3 with chronic aggressive hepatitis. Of the 13 donors with focal necrosis, 7 showed abnormalities of liver function. None of the 3 donors with normal histology showed any liver function abnormalities. BSP retention tests were abnormal in 15 cases, with greater than 6% retention of a standard 5 mg/kg dose at 45 min. These included the donor with cirrhosis, 6 donors with chronic persistent hepatitis, and all 3 donors with chronic aggressive hepatitis. Only 2 of the donors with focal necrosis and none of the 3 with normal histology showed abnormal BSP retention. A BSP retention of 7-11% was found in 5 of 6 donors with chronic persistent hepatitis, while all 3 donors with chronic aggressive hepatitis had a BSP retention of more than 11%. The severity of the histological changes was related neither to the titer of the antigen in the serum nor to the presence of autoantibodies.

0636 IMMUNOGLOBULIN AND AUTOANTIBODY RESPONSE IN ACUTE AND CHRONIC LIVER DISEASE. *(E.)* Vittal, S. B. V.; Dourdourekas, D.; Shobassy, N.; Ainis, H.; Clowdus, B. F.; Steigmann, F. (Hektoen Inst. Med. Res., Cook Cty. Hosp., Chicago, Ill.). *Am. J. Med.* 57(4):546-550, 1974.

Serum immunoglobulin and nonorgan-specific autoimmune responses (autoantibody response) were studied in 269 patients with a variety of acute and chronic liver diseases. About 75% of the patients with either hepatitis B antigen (HB Ag)-positive (40) or HB Ag-negative acute viral hepatitis (40) showed a mild increase in total globulin, γ-globulin, and immunoglobulin G (IgG) levels and a moderate elevation in IgM levels during the first 2 weeks of illness. These values began to subside by the 8th week and were completely normal by the 12th week in association with clinical improvement and return of SGOT values to normal. Serum complement (C_3) levels were low in 20% of the patients with acute viral hepatitis during the first 2 weeks of illness and returned to normal thereafter. Among the patients with acute viral hepatitis, 42.5% had smooth muscle antibody, 20.5% had mitochondrial antibody, 10% rheumatoid factor, and none had antinuclear antibody. These nonorgan-specific autoimmune markers were only transiently present (mean 2 weeks) and became undetectable as the patient's condition improved. There was no difference in these immunologic responses between HB Ag-positive or negative groups. Total globulin, γ-globulin, and IgG levels were above the range of normal in patients with chronic active liver disease (13), alcoholic cirrhosis (82), and in cirrhotic patients with hepatomas (5). Serum IgA levels were increased only in patients with alcoholic liver disease and were more evident in patients with alcoholic hepatitis (7) and cirrhosis. Elevated Ig levels were seen in HB Ag-positive and negative chronic active liver disease, alcoholic hepatitis, and alcoholic cirrhosis. IgM levels were normal in primary (10) and secondary (14) malignant liver disease. HB Ag-positive blood donors with asymptomatic mild liver disease had normal immunochemistry values. Serum complement levels were lower than normal in 50% of patients with chronic liver disease, with or without HB Ag, while C_3 values were normal in the other varieties of chronic liver disease. Smooth muscle antibody was present in 35% of the patients with HB Ag-positive chronic active liver disease (9) and in 20% of the patients with HB Ag-negative chronic active liver disease (4). Antinuclear antibody was present in only 1 of 4 patients with HB Ag-negative chronic active liver disease. Mitochondrial antibody was not seen in any of the patients with chronic active liver disease. Of 10 patients with cirrhosis and hepatoma, 3 had HB Ag, 4 had mitochondrial antibody, 6 had smooth muscle antibody, and 4 had α-fetoprotein. The differentiation of type A hepatitis from type B hepatitis is concluded as impossible from the determination of serum IgM levels. Chronic active liver disease and cirrhosis appear to be associated with a potent stimulus to the proliferation of antibody-synthesizing cells resulting in hypergammaglobulinemia.

0637 AUTOIMMUNE REACTION OF THE "CHISIU TYPE" IN CHRONIC DISEASES OF THE LIVER.

(E.) Costica, I. I.; Dumitru, M.; Benea, F. (23 August Hosp., Bucharest, Rumania). *Roum. Med. Rev.* 18(1):27-31, 1974.

Twenty-eight patients (9 females and 19 males, 20-69 yr old) suffering from chronic diseases of the liver were studied for the presence of antibile autoantibodies. Of the 28 patients, 18 had chronic hepatitis, 8 cirrhosis of the liver, and 2 cancer. The presence of Australia antigen and of antibile autoantibodies was determined by double immunodiffusion in agarose gel. The antigenic type and immunoglobulin class were determined by immunoelectrophoresis. Antibile autoantibodies were detected in 15/28 patients (53.56%) and Australia antigen in 6 cases (21.4%). The concomitant presence of Australia antigen and autoantibodies was found in only 3 patients. There was a statistically significant difference in alkaline phosphatase and bilirubin values between the patients with and without autoantibodies, and in 6/15 positive cases, the liver disease was associated with involvement of the alimentary tract (2 cases duodenal ulcer, 4 cases resected stomach). The presence of antibile autoantibodies implies the existence of a direct contact between the bile antigens and the immunoforming system, and therefore, their passage through the circulation. Two possible pathways for the penetration of the circulatory system by these antigens are proposed: 1) cholestasis; and 2) the antigens may be absorbed in the presence of proteolytic failure of the gastrointestinal tract.

0638 A LYMPHOCYTE-INHIBITING FACTOR ISOLATED FROM NORMAL HUMAN LIVER.

(E.) Schumacher, K.; Maerker-Alzer, G.; Wehmer, U. (Med. Univ. Clin., Cologne, Germany). *Nature* 251(5476):655-656, 1974.

A leukocyte-inhibiting factor was isolated from the soluble supernatant after homogenization and centrifugation of normal human liver at 100,000 g for 90 min in Hanks solution, pH 7.2. A pure substance with inhibiting properties was obtained after elution and ion exchange chromatography. The inhibitor was a protein, molecular weight 65 x 10^3-8 x 10^3. Electrophoretic mobility was slow, similar to the β-gamma globulins. The protein was a potent inhibitor of lymphocyte transformation after stimulation by phytohemagglutin, purified protein derivative and by cellular antigens or transplantation antigens. It also inhibited the metabolism of *in vivo* activated lymphocytes and the migration of macrophages. After PHA stimulation, most of the *de novo* synthesis of RNA was inhibited. The specificity of lymphocyte metabolism inhibition seems to be very high: doses which caused a 100% inhibition of lymphocyte metabolism gave only a very slight reduction of the metabolic rate of HeLa cells. No species specificity of the inhibitor was found. The physiological significance of the inhibitor has not been determined.

0639 HL-A ANTIGEN DISTRIBUTION IN HEPATIC DISEASES.

(Ger.) Freudenberg, K. J.; Erdmann, K.; Meyer zum Buschenfelde, K. H.; Forster, E.; Berger, J. (Med. Univ. Clin. Polyclin. II, Univ. Mainz, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79: 645-646, 1973.

The distribution of the human leukocyte antigen (HL-A) was studied in patients with acute hepatitis, chronic persistent hepatitis, chronic aggressive hepatitis, and cirrhosis. Statistically significant increases were observed in the frequency of HL-A8 in patients with chronic aggressive hepatitis. The statistically insignificant increase in the frequency of HL-A12 determined in patients with chronic persistent hepatitis may be due to the small number of the patients tested. The findings indicate a coupling disequilibrium between the transplantation antigen HL-A8 and genetic factors that cause especially active immune reactions. It is concluded that carriers of this antigen are predisposed for autoimmune diseases.

0640 AUSTRALIA ANTIGEN, HL-A ANTIGENS, AND LYMPHOCYTE AUTOANTIBODIES IN CHRONIC AGGRESSIVE AND CHRONIC PERSISTENT HEPATITIS.

(Ger.) Bertrams, J.; Reis, H. E.; Kuwert, E.; Selmair, H. (Dep. Med. Virol. Immunol., Univ. Essen, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:642-644, 1973.

The frequency of Australia antigen (HB_sAg), human leukocyte antigen (HL-A), and of cold reacting, complement-dependent, auto-lympho-cytotoxins was studied in 77 patients with chronic aggressive hepatitis and in 51 patients with chronic persistent hepatitis. The frequency of HL-A8, determined by Kissmeyer-Nielsen's microlymphocytotoxicity test, was 29.9% in group 1 patients and 21.6% in group 2 patients, *versus* a control value of 20.5%. The HL-A1, 8 frequency was 23.4% in the 1st group, 13.7% in group 2, and 15.8% for controls. HL-A-W-18 frequency was 25.5% in group 2 patients, 7.8% in group 1 patients, and 10% in controls. HB_sAg, determined by migration electrophoresis and micro-complemen binding reaction, was found in 48% of group 1 patients and in 72.6% of the patients in group 2. The frequency of auto-lympho-cytotoxins (CoCoCy), determined at 15 C, was 48.1% in the 1st group, 13.7% in the 2nd group, and 6% in controls. The auto-CoCoCy was found to have antibody and autoantibody properties, and was related to immunoglobulin M (IgM) without showing any correlation with the total serum IgM level. Absence of HL-A specificity, and an optimum reaction

emperature of 15 C were also determined. Significant
orrelation between the occurrence and concentration
f HB_sAg and the course of chronic hepatitis was
stablished. The presence of W-18 antigen in chronic
ersistent hepatitis may be related to the insuffi-
ient immune elimination of HB_sAg or of type MS-2
epatitis virus. HL-A8 and the haplotype HL-A1,8 may
e related to the autoimmune processes observed in
hronic aggressive hepatitis. The findings suggest
hat the different manifestations of chronic aggres-
ive and chronic persistent hepatitis are a result
f the different, individual-specific immune response
f the organism to infection with the pathogen of
erum and infectious hepatitis, or to the autoanti-
ens appearing during infection.

541 CHRONIC LIVER DISEASE AND HEPATITIS-B ANTI-
GEN: A PROSPECTIVE STUDY. *(E.)* Van Waes,
.; Segers, J.; Van Egmond, J.; Van Nimmen, L.;
rbier, F.; Wieme, R.; Demeulenaere, L. (St. An-
ew's Hosp., Tielt, Belgium). *Brit. Med. J.* 5298
):444-446, 1974.

mmunodiffusion or counterelectrophoresis assays for
epatitis B antigen (HB Ag) were performed on 86 pa-
ients (48 men and 38 women) with chronic liver
isease during follow-up periods averaging 38 months
investigate differences in the clinical course of
Ag-positive and HB Ag-negative patients. A diag-
osis of cirrhosis was made in 41 of the patients
ean age 52.1 yr) and chronic hepatitis in 45 (mean
ge 34.8 yr). HB Ag was present in 19 of 45 patients
2.2%) with chronic hepatitis (5 out of 16 with
hronic active hepatitis and 14 out of 29 with chro-
ic persistent hepatitis) and in 20 of 41 cirrhotic
atients upon admission. At the end of the study
of 36 patients still diagnosed as suffering from
hronic hepatitis were HB Ag-positive. In 9 cases
chronic active and 3 chronic persistent) the
hronic hepatitis had changed to cirrhosis, confirmed
peritoneoscopy and biopsy. Positive results for
Ag were found in 18 out of 50 diagnosed cirrhotics
the end of the study. The clinical course and
iochemical and histological findings in the posi-
ive and negative cases for the antigen were similar,
uggesting that HB Ag-positive chronic liver disease
not a distinct clinical entity. No significant
ifferences in the incidence of autoantibodies
antinuclear factor, smooth muscle antibody, and
ntimitochondrial antibody) were found between
Ag-positive patients and those patients negative
or the antigen. Fourteen of 34 patients with
hronic hepatitis were positive for autoantibodies
also HB Ag-positive), while 16 of 35 patients
ith cirrhosis tested were positive (4 also HB Ag-
ositive). In the HB Ag-positive cases the antigen
ended to persist for months and years. The finding
f autoantibodies equally in positive and negative
atients for HB Ag confirms previous observations
hat antigen and autoantibodies are not mutually
xclusive. When no irreversible lesions exist,
isappearance of the antigen may be a sign that
iver disease will resolve.

542 ANTIBODY PATTERN IN AUTOIMMUNE HEPATITIS: CLINICAL SIGNIFICANCE AND DIFFERENTIAL DIAGNOSTIC VALUE. *(Ger.)* Berg, P. A.; Marker, A.; Traunecker, U. (Tubingen Med. Clin., Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:650-653, 1973.

The antibody pattern was studied in autoimmune hepatitis (primary biliary cirrhosis and chronic aggressive hepatitis) in 75 female and 5 male patients in an attempt to classify autoimmune hepatitis to a group with, and another group without mitochondrial antibodies. Mitochondrial antibodies were detected in 41 patients. Primary biliary cirrhosis was diagnosed in 24 cases, and chronic aggressive hepatitis or cryptogenic cirrhosis in 17 cases. Increased alkaline phosphatase levels were found in 38 patients. Antibodies against nuclei and/or smooth muscle were found to occur simultaneously in 10 patients with primary biliary cirrhosis, and in 13 patients with chronic aggressive hepatitis. Of the 39 patients in whom no mitochondrial antibodies were detected, 35 had chronic aggressive hepatitis, and prolonged increase of the alkaline phosphatase level was found in 2 cases. Blood typing in autoimmune hepatitis with known etiology revealed no significant differences in the distribution of groups A and O in HA Ag positive hepatitis, while predominance of group A was determined in primary biliary cirrhosis and in cases in which mitochondrial antibodies were detected. The frequency of group O was 17% in patients with primary biliary cirrhosis, and 50.9% in patients with "lupoid" hepatitis, *versus* the average 41-45%. Further studies will be necessary to determine whether the synchronous occurrence of antibodies against nuclei, smooth muscles, and mitochondria is an indication of a simultaneous process in liver parenchyma and in the bile ducts.

Q643 PLASMA CORTICOSTEROID LEVELS IN CHRONIC HEPATITIS AND CIRRHOSIS. *(Rus.)* Sokolova, G. M.; Dobrova, A. S. (Cent. Inst. Postgrad. Med., Moscow, USSR). *Ter. Arkh.* 46(4):72-75, 1974.

The 17-, 21-oxy- and 20-ketosteroid levels in plasma and diurnal urine were measured in 41 male and 11 female patients with chronic inflammatory liver diseases (26 cases of postnecrotic cirrhosis, 13 cases of portal cirrhosis, 5 cases of biliary cirrhosis, and 7 cases of chronic hepatitis). Reduction of the oxyketosteroid level in the plasma to 8.2 μg%, and normal level in the urine with increased percentage of the free oxyketosteroid fraction were observed in postnecrotic cirrhosis in its subcompensated stage. The 17-ketosteroid level in the urine decreased to 7.4 mg/day. The plasma oxyketosteroid level was below normal in decompensated postnecrotic cirrhosis, but higher than in subcompensated cirrhosis. The total urinary excretion of oxyketosteroids was normal with increased percentage of free oxyketosteroids. Significant reduction of plasma oxyketosteroid levels, slight reduction of the urinary excretion of oxyketosteroids with increased percentage of free oxyketosteroids, and slightly increased 17-ketosteroid were observed in decompensated portal cirrhosis. Reduced plasma and urinary oxyketosteroid levels, and considerable reduction of 17-ketosteroid excretion were found in biliary cirrhosis. Negligible reduction of the plasma oxyketosteroid level, considerable decrease in the total oxyketosteroid excretion, and moderately increased excretion of free oxyketosteroids were established in chronic hepatitis. The reduced plasma oxycorticosteroid levels, observed in all patients, especially in those with chronic hepatitis, reflected the reduced function of the adrenal cortex. Increased free oxyketosteroid levels in the urine was a consequence of the disturbed inactivation and conjugation function of the liver, and further enhanced the inhibition of the adrenal cortex. No substantial difference was found between the plasma and urine oxyketosteroid levels in patients with splenomegaly and hypersplenism and in patients with splenomegaly alone.

0644 THE SPONTANEOUS LONG-TERM EVOLUTION OF CHRONIC AGGRESSIVE HEPATITIS. *(E.)* Knoblauch, M.; Ammann, R.; Clavadetscher, P.; Grob, P.; Schmid, M. (Univ. Hosp., Zurich, Switzerland). *Digestion* 10(4/5):360, 1974.

0645 GROSS IMPAIRMENT OF HEPATIC DRUG METABOLISM IN A PATIENT WITH CHRONIC LIVER DISEASE. *(E.)* Adjepon-Yamoah, K. K.; Nimmo, J.; Prescott, L. F. (R. Infirm., Edinburgh, Scotland). *Br. Med. J.* 4(5941):387-388, 1974.

0646 IMPAIRED T-LYMPHOCYTE FUNCTION IN CHRONIC HEPATITIS? *(E.)* Tolentino, P.; Pasino, M.; Braito, A.; Astaldi, Jr., A.; Giacchino, R. (Dep. Infect. Dis., Univ. Genoa, Italy). *Digestion* 10(4/5): 331, 1974.

0647 INFLUENCE OF RIFAMPICIN ON METABOLIC CLEARANCE OF HEXOBARBITAL AND TOLBUTAMIDE IN HEALTHY SUBJECTS AND IN PATIENTS WITH CHRONIC LIVER DISEASE. *(E.)* Zilly, W.; Breimer, D. D.; Keller, B.; Dosch, A.; Richter, E. (Dep. Intern. Med., Wurzburg Univ., Germany). *Digestion* 10(4/5):313, 1974.

0648 ANTIBODIES TO HUMAN PANCREAS IN LIVER DISEASES. *(E.)* Rizzetto, M.; Verme, G. (Mauriziano Hosp., Turin, Italy). *Digestion* 10(4/5):377, 1974.

See also, 0171, 0573, 0577, 0597, 0610, 0626, 0629, 0660.

LIVER AND BILIARY TRACT

Alcoholic Liver Disease

0649 STUDIES IN ALCOHOLIC LIVER DISEASE IN BRITAIN. I. CLINICAL AND PATHOLOGICAL PATTERNS RELATED TO NATURAL HISTORY. *(E.)* Brunt, P. W.; Kew, M. C.; Scheuer, P. J.; Sherlock, S. (R. Free Hosp. Med. Sch., London, England). *Gut* 15(1): 52-58, 1974.

A group of 258 British patients with various forms of alcoholic liver disease, such as steatosis, mild and severe hepatitis, and cirrhosis, was studied to investigate the clinical and histopathological forms of the disease, to relate these forms to the outcome, and to define factors which may influence prognosis. Of the 258 patients, 183 (71%) were males and 75 (29%) were females. There was no sex difference in the age distribution (mean of 50.0 yr and 50.4, resp.). Severity of the disease as judged histologically did not correlate well with clinical presentation although signs of hepatocellular failure were more common in severe hepatitis and cirrhosis. Fever, pigmentation, and clubbing were also indicators of these two conditions. It is suggested that alcoholic hepatitis is probably precirrhotic and carries a poor prognosis with laboratory signs of a moderate elevation of WBC and bilirubin. Poor survival in alcoholic liver disease was associated with continued drinking, the presence of active hepatitis, and probably with poor social (and nutritional) status.

0650 IMPAIRED ABSORPTION OF MICELLAR LONG-CHAIN FATTY ACID IN PATIENTS WITH ALCOHOLIC CIRRHOSIS. *(E.)* Malagelada, J. R.; Pihl, O.; Linscheer, W. G. (Tufts Univ. Sch. Med., Boston, Mass.). *Am. J. Dig. Dis.* 19(11):1016-1020, 1974.

Absorption of micellar long-chain fatty acid was diminshed in 12 chronic alcoholic patients with liver cirrhosis when compared with controls as demonstrated during perfusion of the proximal small bowel with a micellar solution of long-chain fatty acid (oleic). In the cirrhotic patients the rate of absorption of oleic acid was only 1.0 μM/min/cm compared with 1.8 μM/min/cm for the controls. Parallel experiments showed no difference in absorption of medium-chain fatty acids (octanoic): 5.7 μM/min/cm for cirrhotic patients and 7.1 μM/min/cm for controls. The results suggest impairment of the mucosal transport of long-chain fatty acid in cirrhosis. It is suggested that this abnormality, possibly related to portal or lymphatic hypertension, contributes to fat malabsorption and malnutrition in these patients.

0651 BILIARY DEOXYCHOLATE IN PATIENTS WITH ALCOHOLIC CIRRHOSIS. *(E.)* Mehta, S. J.; Struthers, Jr., J. E.; Kaye, M. D.; Naylor, J. L. (Denver VA Hosp., Colorado). *Gastroenterology* 67(4): 674-679, 1974.

Deoxycholate metabolism was studied in 10 patients with biopsy-proved alcoholic cirrhosis. Deoxycholate was absent from the bile of 3, present in reduced quantities in 3, and present in normal amounts in patients as determined by ion-exchange column chromatography. The oral administration of cholic acid (1.0 g daily for 4 days) was accompanied by a rise in biliary deoxycholate from subnormal to normal levels in 3 patients but had little or no effect in the 3 whose bile initially contained no deoxycholate. The feeding of conjugated deoxycholate, 0.4 g daily for 4 days, to 2 of the latter patients resulted in the prompt appearance of deoxycholate in bile. As a result of these studies it was impossible to identify a single mechanism responsible for reduction of biliary deoxycholate in patients thus affected. Rather, it appears that both a relative lack of substrate (cholic acid) and deficient intestinal conversion of cholic acid to deoxycholate may contribute to the observed reductions in biliary deoxycholate.

0652 CLINICAL STUDIES OF ALCOHOLIC KETOACIDOSIS. *(E.)* Cooperman, M. T.; Davidoff, F.; Spark, R.; Pallotta, J. (Beth Israel Hosp., Boston, Mass.). *Diabetes* 23(5):433-439, 1974.

The clinical findings and biochemical changes in 6 nondiabetic female patients who had 7 episodes of severe ketoacidosis are reported. One pregnant patient had 2 episodes at 28 and 32 weeks gestation; all patients admitted to heavy chronic alcohol intake. On admission, the patients were conscious and alert. Mean values were 143 mg/100 ml for plasma glucose and 7.25 for arterial pH. Plasma bicarbonate was depressed with a mean anion gap of 18. β-Hydroxybutyrate:acetoacetate ratio averaged 5.2. All patients had liver function abnormalities. Mean serum immunoreactive insulin was low, 5 μU/ml, cortisol was elevated at 76.5 μg%, and mean growth hormone level was 14.1 ng/ml. Free fatty acid concentration, measured on admission in 1 episode, was 1,945 mEq/liter. Therapy with glucose, saline, and minimal amounts of alkali led to prompt recovery. The preponderance of women reported with this condition suggests a possible role for ovarian and placental hormones in its pathogenesis. Fetal drain on carbohydrate reserves may further contribute to the tendency to ketosis.

0653 ASCORBIC-ACID SATURATION AND ETHANOL METABOLISM. *(E.)* Krasner, N.; Moore, M. R.; Dow, J.; Goldberg, A. (Stobhill Gen. Hosp., Glasgow, Scotland). *Lancet* 2(7882):693-694, 1974.

In a study of 12 patients with clinical or biochemical evidence of non-alcoholic liver disease, ascorbic-acid levels, measured as leukocyte ascorbic acid, were correlated with activities of hepatic alcohol dehydrogenase. The results showed a highly significant linear correlation between hepatic alcohol-dehydrogenase activity and leukocyte ascorbic acid levels with a correlation coefficient r = 0.88. In another series of experiments on healthy male volunteers, the clearance of ethanol from the blood (β60) was measured before and after treatment with oral ascorbic acid in a dose of 1 g daily for 2 weeks. The results indicated that there was a significant rise in leukocyte ascorbic acid levels, except in 2 instances where they were depressed. There was a highly significant rise in β60 except in those subjects with reduced levels of leukocyte ascorbic acid in whom the β60 values were also depressed. A significant correlation was found between β60 and leukocyte ascorbic acid levels r = 0.6. It seems therefore that there is an association between ascorbic acid and ethanol metabolism and that the enhanced rate of ethanol clearance from the blood may be associated with increased activities of alcohol dehydrogenase.

0654 LIVER STEATOSIS IN HUMAN PATHOLOGY. *(E.)* Popper, H. (Mt. Sinai Sch. Med., City Univ. New York, N.Y.). *Rend. Gastroenterol.* 5(3):213-214, 1973.

0655 FECAL CHYMOTRYPSIN IN ALCOHOLIC LIVER DISEASE. *(E.)* Moeller, D. D.; Dunn, G. D.; Klotz, A. P. (Univ. Kansas Med. Cent., Kansas City). *Am. J. Dig. Dis.* 19(12):1138-1142, 1974.

0656 EFFECT OF ETHANOL ON MITOCHONDRIAL ADENOSINE TRIPHOSPHATASE (ATPase) AND ALCOHOL DEHYDROGENASE (ADH) METABOLISM EVALUATED BY QUALITATIVE HISTOCHEMISTRY. *(E.)* Monteiro, E.; Cristina, M. L.; Batista, A.; Pinto Correia, J. (Santa Maria Hosp., Lisbon, Portugal). *Digestion* 10(4/5):369, 1974.

See also, 0130, 0134, 0256.

LIVER AND BILIARY TRACT

Cirrhosis

0657 HEPATIC CIRRHOSIS AND THE SUDDEN DEATH SYNDROME. *(E.)* Berkheiser, S. W. (Harrisburg Polyclin. Hosp., Pa.). *Aerosp. Med.* 45(8):954-958, 1974.

An analysis of the 3,693 autopsies performed at a large general hospital between 1957 and 1967 disclosed 118 cases (3.2%) in which cirrhosis was clinically and pathologically significant. The average age of these 118 patients was 58 years. 74% were males. The cirrhosis was latent prior to death in 59%, and 32% died within 12 hours from the sudden onset of final symptoms. Typical portal cirrhosis was found in 81.4% of the patients, fatty cirrhosis in 11%, obstructive biliary cirrhosis in 5%, and hemochromatosis in 2.5%. Ulcerative colitis and cirrhosis were noted in only 3 patients (2.5%). Significant clinical findings included hepatomegaly (48%), splenomegaly (78%), and ascites (37%). Thirty-eight percent of the patients admitted to a history of chronic alcoholism. Among the 38 cases of sudden death, the primary immediate cause of death was cardiovascular disease in 39.5% of the patients, rupture of esophageal varices in 16%, liver failure in 13%, and gastrointestinal hemorrhage, pneumonia, and miscellaneous causes, 10.5% each. It is suggested that screening for unsuspected cirrhosis warrants serious consideration because of the rising incidence of this disease and its probability for producing sudden disability or death.

0658 PREGNANCY AND CIRRHOSIS OF THE LIVER. *(Ger.)* Manzl, J. (Reg. Hosp., Salzburg, Austria). *Zentralbl. Gynaekol.* 96(30):946-949, 1974.

After pregnancy and parturition without any complication, sudden death occurred in a para 5 due to intra-abdominal bleeding caused by a ruptured vein of the Plexus ovaricus sinister on the 4th postpartum day. Eutrophic, macronodular cirrhosis of the liver and tumor of the spleen were found on autopsy. Anastomoses between the origin of the portal vein and the veins of the pelvis results in the portal hypertension immediately involving the gonadal plexus in cirrhosis, thus causing rupture of the vein. Hypertension in the gonadal veins is further enhanced by varicose veins. The findings indicate the high probability of a causal relationship between varicose veins, cirrhosis, portal hypertension, and rupture of the gonadal vein.

0659 THE "CRYPTOGENETIC" FEVER OF ALCOHOLIC CIRRHOSIS. CLINICAL, LABORATORY AND PATHOLOGY CORRELATIONS IN 72 CASES. *(Fr.)* Bergerault, P.; Le Bodic, M. F.; Lenne, Y.; Le Bodic, L.; Oudea, P.; Miniconi, P. (St. Jacques Hosp., Nantes, France). *Ann. Gastroenterol. Hepatol. (Paris)* 9(6): 537-545, 1973.

Patients hospitalized for alcoholic cirrhosis were classified into 3 groups: 1) apyretic (91 cases, 27.3%); 2) with fever of known origin (171 cases, 51.2%); 3) with cryptogenetic fever (72 cases, 21.5%). All the patients underwent a thorough clinical examination and a number of laboratory and histologic tests. There were no significant clinical differences between the 3 groups. Of the laboratory test values, only the concentration of SGOT was significantly higher for group 3 than for the other 2 groups. Of the histologic tests, there were significantly higher levels of Mallory bodies in 60% of the cases of group 3 and cellular necrosis and infiltration of polynuclears in the parenchyme in 70% of the cases of group 3 compared with the other 2 groups. These histologic signs indicate subacute hepatitis, which has been suggested by other authors as a cause of cryptogenetic fever in alcoholic cirrhotics. To account for the 30% of the cases where these signs were not present, other authors have suggested subclinical intestinal infection, pyrogenic steroids, bacteria produced substances, and hepatic insufficiency.

0660 ANTI-T AGGLUTININ IN CIRRHOSIS OF THE LIVER. *(E.)* Boccardi, V.; Attina, D.; Bigliocchi, S.; Girelli, G. (Inst. Pathol., Med. I, Univ. Rome, Italy). *Vox Sang.* 26(1):83-85, 1974.

Titration for anti-T activity was performed on 46 patients of whom 44 had liver cirrhosis and 2 had advanced chronic active hepatitis. No significant change of titer was detected after storage of the samples for several months. In general, screening tests for irregular isoantibodies active on untreated and papain-treated red cells were negative. Compared with normal control sera, the anti-T titer in the cirrhotic sera was significantly elevated. All cirrhotic patients showed increased γ-globulin levels of the polyclonal peak type, but there was no correlation between γ-globulin level and anti-T titer. Similarly, the antibody titer was not related to clinical condition. In one chronic active hepatitis patient, the antibody titer fell from 8 to 2 after 5 months treatment with azathioprine; a control biopsy revealed histological improvement with a fall in γ-globulins. Anti-T also fell from 8 to 1 in a patient treated 3 months with β-metasone, but there was no significant alteration in the γ-globulin level. There were no changes in titer in 9 other patients undergoing no immunosuppressive treatment.

0661 MORPHOLOGICAL CHANGES IN SMALL INTESTINAL MUCOSA IN CIRRHOSIS. *(Sp.)* Herrerias Gutierrez, J. M.; Jimenez Pereperez, J.; Damiano Rivero, A.; Jurado Nieto-Guerrero, M. (Fac. Med., Cadiz, Spain). *Rev. Esp. Enferm. Apar. Dig.* 43(6): 603-610, 1974.

The structure of jejunal mucosa was studied in biopsies taken from 20 patients (16 males and 4 females, aged 16-72 yr) with histologically confirmed septal, micronodular cirrhosis and diarrhea. Peroral aspiration biopsies were taken with a modified Crosby-Kugler capsule distal to the angle of Treitz 60 min after administration of metoclopramide (10 mg i.v.). The pattern of the jejunal mucosa was normal in 40% of the biopsies. Abnormalities consisted of epithelial stasis and edema (10%), villous stasis (10%), and epithelial edema with changes in the villi (10%). Findings typical of sprue were present in 10%, inflammation in 10%, sclerosis of the lamina propria in 5%, and epithelial ulcerations with flattening of the villi in 5%.

0662 PERITONEO-VENOUS SHUNTING FOR ASCITES. *(E.)* LeVeen, H. H.; Christoudias, G.; Ip, M.; Luft, R.; Falk, G.; Grosberg, S. (VA Hosp., Brooklyn, N.Y.). *Ann. Surg.* 180(4):580-591, 1974.

A new minor surgical procedure for ascites is decribed wherein a 1-way pressure activated valve is implanted to create a permanent peritoneo-venous shunt. The normally closed valve opens only when the peritoneal pressure rises 3-5 cm higher than the intrathoracic venous pressure, thus preventing backflow of blood and closing of the valve should the venous pressure rise from the overinfusion of ascitic fluid. The patient is started on respiratory exercises (reclining position) 24-48 hr after the operation which consist of inspiring through a tube against a resistance of 5 cm of water. The exercise is continued postoperatively for 15 min, 4 times a day, to take advantage of the pumping action created by the negative intrathoracic pressure. Cooperation of the patient during the exercises is essential in eliminating all of the ascites. Excluding immediate deaths from end stage disease (9 patients) and infections necessitating valve removal (2 patients), the procedure was successful in 26 out of a remaining 34 cases. One-third of the shunts became occluded usually 1-2 weeks postoperatively after the ascites had completely disappeared. Leakage of ascitic fluid around the threads of the valve allowing blood to replace the ascitic fluid in the venous tubing accounted for 90% of the failures. This defect has been corrected by sealing the threads. Occlusion of the shunt produces only temporary failure and requires prompt valve replacement.

0663 ORIGIN OF FAT IN CHYLOUS ASCITES OF PATIENTS WITH LIVER CIRRHOSIS.

(E.) Malagelada, J. R.; Iber, F. L.; Linscheer, W. G. (Lemuel Shattuck Hosp., Tufts Univ. Sch. Med., Boston, Mass.). *Gastroenterology* 67(5):878-886, 1974.

The origin of fat in chylous ascites of cirrhotic patients was investigated by feeding medium and long chain fatty acids (20 mM Trioctanoin labeled with 50 μCi ^{14}C-octanoic acid and 20 mM Triolein labeled with 50 μCi ^{3}H-oleic acid). The patients included 3 cirrhotic patients with chylous ascites (2 men and 1 woman, aged 42-70 yr), 8 patients with cirrhosis and non-chylous ascites (7 men and 1 woman, aged 42-66 yr), and 4 noncirrhotic patients with chylous ascites (2 women and 2 men, average age 49 yr). The time of appearance (1 hr after feeding), time interval from ingestion to peak levels (5 hr), and half-life time of decay (58 hr) of labeled long chain fatty acids in ascitic chylomicrons were similar in all groups of patients. In the cirrhotic patients, however, the peak activity of long chain fatty acids found in chylous ascites (8% of ingested radioactivity) was much greater than in clear ascites (0.6%). An even greater amount of ingested long chain fatty acids was found in the chylous ascites of noncirrhotic patients (22%). More than 80% of the ingested labeled oleic acid present in chylous ascites was incorporated in esterified form in chylomicrons as compared to less than 50% in clear ascitic fluid. This significantly higher incorporation of ^{3}H radioactivity in subjects with chylous ascites when serum levels were identical suggests that intestinal lymph was the main source of ascitic chylomicrons. The appearance, concentration, and decay rate in ascites of ^{14}C-octanoic acid not incorporated in the chylomicrons was similar in cirrhotic patients with clear or chylous ascitic fluid, suggesting a similar pathway for transport of the non-protein-bound labeled octanoic acid. Within 5 hr after administration, free octanoic acid reached peak concentrations in both groups, followed by a rapid decline with only very small amounts (less than 25% of peak remaining after 12 hr). A relatively low proportion of triglycerides were found in clear ascitic fluid (37 *versus* 295 for chylous cirrhotics and 898 for chylous noncirrhotics), indicating that most of the triglycerides were present in the smaller particles, probably a combination of small chylomicrons and very low, low, and high density lipoproteins. Only small chylomicrons, probably leaking from the intestinal lymphatics, appeared to enter the ascites of cirrhotic patients with clear ascitic fluid. When the number and size of these chylomicrons increases, the ascitic fluid acquires a chylous nature. Whether the underlying pathogenesis involves abnormal permeability or rupture of the lymphatics is unknown, but the process may reverse with improvement of liver function.

0664 HEMORRHAGE FROM A PORTAL-SYSTEMIC VENOUS SHUNT WITH UNUSUAL LOCALIZATION IN A CASE OF PORTAL HYPERTENSION.

(E.) Borjesson, B.; Olsson, A. M.; Vang, J. O. (Univ. Hosp., Lund, Sweden). *Scand. J. Gastroenterol.* 9(6):571-573, 1974.

Hemorrhage from a portal-systemic collateral vein leading from the mesentery of the ileum to the lateral right pelvic wall is described for a 48-yr-old woman with portal hypertension. The patient had previously undergone a subtotal gastrectomy *ad modum* Billroth II for accidental hydrochloric acid ingestion (27 yr prior), a vagotomy after development of an ulcer (16 yr prior), and a Billroth I reconstruction following diagnosis of a new stomal ulcer and a stomal stricture (9 yr prior). The patient had also been previously admitted (4 yr prior) because of hematemesis and melena. Surgical exploration at this prior admission had revealed a cirrhotic liver which was cryptogenic, and splenoportography had shown varicose veins in the esophagus. The patient was readmitted 4 yr after these observations because of melena recurrence, followed by the development of hepatic coma a few days later. Vasopressin infusion in 2 instances and Sengstaken tube treatment in 1 instance were successful in stopping the bleeding for periods of about 2 days. Angiography of the celiac axis and the superior and inferior mesenteric arteries revealed varicose veins around the duodenum and terminal part of the ileum. During abdominal exploration following onset of the symptoms of ileus, a sigmoid volvulus was found along with adhesion of the last part of the ileum to the region of the right ovary. During dissection, a finger-wide vein was found leading from the mesentery of the ileum, *via* the ileum wall, to the lateral right pelvic wall. Opening of the ileum during resection revealed the vein bulging into the lumen, with a blood clot appearing in a hole located in the vein wall. The resection was uneventful, and the patient has had no further hemorrhages (18 months after operation). The bleeding portal-systemic collateral probably developed in a postoperative adhesion. The difficulty in evaluating a given treatment for such patients is illustrated by the fact that on 1 occasion a Sengstaken tube promptly stopped the bleeding even though there was not even a theoretical possibility of its influencing the hemorrhage.

0665 CLINICO-MORPHOLOGICAL CORRELATIONS IN THE PORTAL HYPERTENSION SYNDROME DUE TO SUBHEPATIC OBSTRUCTION. *(Rus.)* Simonov, V. V.; Kalashnikov, S. A. (S.M. Kirov Mil. Med. Acad., Leningrad, USSR). *Vestn. Khir.* 112(1):41-44, 1974.

Morphological liver studies of 44 patients with subhepatic obstruction of the portal blood flow revealed one case of cirrhosis. Vena portal thrombosis was the main cause of the subhepatic obstruction (15 cases). Findings show that hypertension caused by subhepatic obstruction did not result in cirrhosis. Marginal biopsy in the 15 cases did not indicate any morphological changes of the liver. Hepatic changes in the remaining cases were intumescence of periportal interlayer outgrowths, and evidence of lymphoidohistiocytary infiltrations which were observed in other lesions. In some cases hepatic cell dystrophy may be related to the impaired portal blood flow. No relation was found between the cause of the subhepatic obstruction and the characteristic clinical symptoms.

0666 PROGRESS REPORT: MITOCHONDRIAL ANTIBODIES (AMA). *(E.)* Doniach, D.; Walker, G. (Middlesex Hosp., London, England). *Gut* 15(8):664-668, 1974.

The use of mitochondrial antibodies as a diagnostic tool for the detection of primary biliary cirrhosis is reviewed. These antibodies have been detected in 84-96% of patients with primary biliary cirrhosis. They occur in patients with cryptogenic cirrhosis, in some patients with active chronic hepatitis, in a small percentage of patients with various collagenoses, and in the idiopathic autoimmune disorders of the thyroiditis/gastritis/adrenalitis group. Two systemic lupus erythematosus-like syndromes without liver involvement have been identified in which mitochondrial antibodies are a feature. Aside from these disorders, several large epidemiological studies have confirmed the rarity of mitochondrial antibodies in the general population and also in patients with cirrhosis of types other than those discussed above. An explanation for the reported positive mitochondrial antibodies in extrahepatic biliary disease may be found in the number of immunofluorescence patterns which may be produced in the tissues of different species with human sera; for instance, at least 6 discrete reactions may resemble those produced by mitochondrial antibodies on rat kidney and stomach sections, which are frequently used as substrates for mitochondrial antibody tests. In the context of sera from liver patients, the most important reaction to be differentiated is that produced by the microsomal antibodies. Other patterns resembling those due to mitochondrial antibodies are unconnected with liver disease. The origin of mitochondrial antibodies is still largely unexplained but it is possible that a virus or related particle plays a causal role in autoimmune disorders or that some phage-like organism invades the mitochondria in bile duct cells in primary biliary disease.

0667 THE EPIDEMIOLOGY OF PRIMARY BILIARY CIRRHOSIS: A SURVEY OF MORTALITY IN ENGLAND AND WALES. *(E.)* Hamlyn, A. N.; Sherlock, S. (Roy. Free Hosp., London, England). *Gut* 15(6):473-479, 1974.

Over a 5-yr period (1967-1971) deaths from primary biliary cirrhosis in England and Wales amounted to 165 (146 women and 19 men). This corresponds to a crude death rate of 1.2/million/yr for females or 0.6/million/yr for both sexes. Deaths rose sharply at ages 50-54, where mortality was 4.1/million/yr, with a secondary peak to ages 70-74. Standardized mortality ratios varied from 52 (i.e., 52% of the national average) in the North of England to 141 in the London area. No relation existed between regional mortality and altitude, rainfall, annual temperature variation, soil type, or the presence of heavy industry or mining. There was a suggestive excess of deaths (134) among married women. The greater frequency of deaths in the London area, a rise in mortality from country to urban areas, a fall-off in deaths from primary biliary cirrhosis in old age, and predominance for social class I (professional occupations) suggest a simple relation with standards of medical care of diagnosis. An 'epidemic' of deaths in 1971 is attributed to greater availability of the mitochondria antibody test in the regions. Subjective impressions that primary biliary cirrhosis was more prevalent in Wales than in England were not confirmed. If genetic mechanisms are important, as appears from familial reports, they must be widely distributed in the general population.

0668 USE OF BUMETANIDE IN THE TREATMENT OF ACITES [SIC!] DUE TO LIVER DISEASE. *(E.)* Moult, P. J. A.; Lunzer, M. R.; Trash, D. B.; Sherlock, S. (R. Free Hosp., London, England). *Digestion* 10(4/5):370, 1974.

0669 ADHERENCE OF COAGULATION FACTORS TO THE DIALYSIS MEMBRANE OF THE ASCITES REINFUSION MACHINE: EXPLANATION FOR PROLONGATION OF PROTHROMBIN TIME. *(E.)* Wilkinson, S. P.; Portmann, B.; Henderson, J.; Williams, R. (King's Coll. Hosp., London, England). *Digestion* 10(4/5):387, 1974.

0670 CYSTIC FIBROSIS MANIFESTED AS FOCAL BILIARY CIRRHOSIS IN A NEWBORN INFANT WITH CONGENITAL HEART DISEASE. *(E.)* Cooper, H. S.; Oppenheimer, E. H. (John Hopkins Univ. Sch. Med., Hosp., Baltimore, Md.). *John Hopkins Med. J.* 135(4):268-273, 1974.

0671 THE BILIARY SYSTEM IN PRIMARY BILIARY CIRRHOSIS: A STUDY BY ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY (ERCP). *(E.)* Summerfield, J. A.; Elias, E.; Dick, R.; Sherlock, S. (R. Free Hosp., London, England). *Digestion* 10(4/5):381-382, 1974.

0672 ANATOMIC BASIS OF THE SURGICAL TREATMENT OF PORTAL HYPERTENSION. *(E.)* Salam, A. A.; Warren, W. D. (Emory Univ. Sch. Med., Atlanta, Ga.). *Surg. Clin. North Am.* 54(6):1247-1257, 1974.

0673 SPLENIC VEIN THROMBOSIS, SEGMENTAL PORTAL HYPERTENSION AND BLEEDING ESOPHAGEAL VARICES PRODUCED BY A CONGENITAL PANCREATIC CYST. *(E.)* Wolloch, Y.; Chaimoff, C.; Lubin, E.; Dintsman, M. (Beilinson Hosp., Petah Tikva, Israel). *Isr. J. Med. Sci.* 10(6):670-673, 1974.

0674 PORTAL HYPERTENSION WITH VARICES IN ECTOPIC SITES. *(E.)* Hamlyn, A. N.; Lunzer, M. R.; Morris, J. S.; Puritz, H.; Dick, R. (R. Free Hosp., London, England). *Digestion* 10(4/5):353-354, 1974.

0675 MORPHOLOGICAL FEATURES OF INDIAN CHILDHOOD CIRRHOSIS: THE SPECTRUM OF CHANGES AND THEIR SIGNIFICANCE. *(E.)* Aikat, B. K.; Bhattacharya, T.; Walia, B. N. S. (Postgrad. Inst. Med. Educ. Res., Chandigarh, India). *Indian J. Med. Res.* 62(7):953-963, 1974.

0676 KINETIC STUDIES OF THE METABOLISM OF UNCONJUGATED BILIRUBIN IN PATIENTS WITH COMPENSATED CIRRHOSIS. *(E.)* Owens, D.; Jones, E. A.; Richards, T. G.; Carson, E. (Dep. Med., Univ. Liverpool, England). *Digestion* 10(4/5):372-373, 1974.

0677 THE URINE EXCRETION OF HYDROXYPROLINE BY CIRRHOSIS OF THE LIVER. *(E.)* Dinkov, I.; Conev, K.; Mineev, M. (I.P. Pavlov Higher Med. Inst., Plovdiv, Bulgaria). *Folia Med. (Plovdiv)* 15(3):151-155, 1973.

0678 SERUM COPPER IN COMPLEX INVESTIGATIONS OF LIVER CIRRHOSIS. *(E.)* Mincev, M.; Geneva, B.; Kostova, S. (I.P. Pavlov Higher Med. Inst., Plovdiv, Bulgaria). *Folia Med. (Plovdiv)* 15(5):265-269, 1973.

0679 ABNORMALITY IN TISSUE FERRITIN IN IDIOPATHIC HAEMOCHROMATOSIS. *(E.)* Powell, L. W.; Alpert, E.; Drysdale, J. W.; Isselbacher, K. J. (Massachusetts Gen. Hosp., Boston). *Aust. NZ J. Med.* 4(3):303-304, 1974.

0680 THE ABNORMAL LEVEL OF ISOENZYMES OF PLASMA MONOAMINE OXIDASE (MAO) IN FIBROTIC LIVER DISEASE. *(E.)* Lin, A. M.; Davis, L. M.; Castell, D. O. (U.S. Nav. Hosp., Philadelphia, Pa.). *Gastroenterology* 67(4):810, 1974.

0681 LIVER CIRRHOSIS. *(Fl.)* De Groote, J. (St. Rafael Gen. Hosp., Louvain, Belgium). *Tijdschr. Geneesk.* 29(14):687-690, 1973.

0682 MESOCAVAL AND PORTACAVAL SHUNTS USING PANELLED BOVINE ARTERIAL H GRAFTS. *(E.)* Rosenberg, N.; Konigsberg, S. F.; Noronha, J. (Rutgers Med. Sch., New Brunswick, N.J.). *Arch. Surg.* 109(6):754-758, 1974.

0683 FAMILIAL OCCURRENCE OF A MEMBRANE IN THE SUPRAHEPATIC SEGMENT OF THE INFERIOR VENA CAVA (IVC). *(E.)* Erkelens, D. W.; Homan van der Heide, J. N.; Potocky, V.; Beekhuis, G.; Gips, C. H. (Univ. Hosp., Groningen, Netherlands). *Digestion* 10(4/5):347-348, 1974.

0684 BIOCOMPATIBILITY OF RESIN PERFUSION FOR THE REMOVAL OF CHOLEPHILIC ANIONS FROM THE PLASMA IN LIVER FAILURE: EXPERIMENTAL AND CLINICAL STUDIES. *(E.)* Weston, M. J.; Mellon, P.; Langley, P. G.; Williams, R. (King's Coll. Hosp., London, England). *Digestion* 10(4/5):386, 1974.

0685 WHAT IS THE REASON FOR THE CHARACTERISTIC SCAN ABNORMALITY SEEN WITH CHRONIC LIVER DISEASE? *(E.)* Horisawa, M.; Goldstein, G.; Waxman, A.; Reynolds, T. (Univ. South. California Sch. Med., Los Angeles). *Gastroenterology* 67(4):799, 1974.

See also, 0153, 0195, 0196, 0380, 0381, 0382, 0383, 0444, 0569, 0572, 0573, 0577, 0584, 0590, 0635, 0641, 0643, 0648.

LIVER AND BILIARY TRACT

Gallbladder and Biliary Tract Diseases

0686 FACTORS INFLUENCING THE LONG TERM RESULTS OF CHOLECYSTECTOMY. *(E.)* Stefanini, P.; Carboni, M.; Patrassi, N.; Loriga, P.; De Bernardinis, G.; Negro, P. (Univ. Rome Med. Sch., Italy). *Surg. Gynecol. Obstet.* 139(5):734-738, 1974.

Eight hundred patients who underwent cholecystectomy during the period 1960 to 1973 were evaluated in a follow-up study to establish the frequency and severity of postcholecystectomy symptoms and to analyze the possible factors influencing these distresses. The longest follow-up period was 12 yr 6 months, the average time being 4 yr 2 months. There were 551 patients who had symptomatic cure; 217, mild symptoms; and 32, severe symptoms. Residual stones in the common bile duct and stenosis at the sphincter of Oddi were found to be the underlying causes of severe postcholecystectomy distress. Telecholangioscopy associated with cholangiography was helpful in detecting common bile duct diseases. The routine use of this procedure decreased overlooked biliary disorders from 8 to 2%. The procedure of choice in the treatment of residual stones in the common bile duct and stenosis at the sphincter of Oddi was sphincteroplasty, which provided excellent long term results with a low operative motality rate. Mild postcholecystectomy symptoms were found to be related to hepatic damage which usually is present in patients with gallbladder disease. The frequency of these distresses was significantly influenced by the degree of hepatic damage present before operation. Patients with a long interval between onset of symptoms and cholecystectomy and with severe inflammation of the gallbladder had a higher incidence of mild distress.

0687 DYSFUNCTION OF THE SPHINCTER OF ODDI IN A POSTCHOLECYSTECTOMY PATIENT.

(E.) Manier, J. W.; Cohen, W. N.; Printen, K. J. (Univ. Iowa Hosp. Clin., Iowa City). *Am. J. Gastroenterol.* 62(2):148-150, 1974.

A postcholecystectomy patient with recurrent episodes of right upper quadrant pain associated with transient elevations of the SGOT, LDH and alkaline phosphatase was diagnosed as having a motor malfunction of his sphincter of Oddi. During an i.v. cholangiogram, he developed radiographically demonstrated ductal distention and pain. A subsequent exploration of his duct was negative. An operative cholangiogram revealed a mildly dilated duct which emptied slowly into the duodenum. A choledochoduodenostomy was performed. The postoperative course was uncomplicated and at a 4-month follow-up, the patient was well without recurrence of his original symptoms.

0688 CHOLESTASIS ASSOCIATED WITH EXTRABILIARY HODGKIN'S DISEASE: REPORT OF THREE CASES AND REVIEW OF FOUR OTHERS.

(E.) Perera, D. R.; Greene, M. L.; Fenster, L. F. (Dep. Med., Univ. Washington, Seattle). *Gastroenterology* 67(4):680-685, 1974.

Case histories are reported for 3 patients (all women ranging in age from 21-36 yr) with Hodgkin's disease who developed idiopathic cholestasis, and the salient features of 4 cases previously described in the literature are reviewed. Although idiopathic cholestasis is usually associated with advanced lymphomas, 2/3 patients had cholestatic jaundice during early Hodgkin's disease (stages I and IIA), and their jaundice improved during localized radiotherapy. All 7 patients had at least 1 laparotomy; all had liver biopsies, and 6/7 had operative cholangiograms. Evidence for Hodgkin's disease was not present on liver biopsy or at gross inspection of the liver at surgery, and the biliary tract was patent in every case. All liver biopsies demonstrated cholestasis. Five patients died, the time from onset of jaundice to death being 5-19 months. At postmortem examination, stage III or IV Hodgkin's disease was present in all 5 patients. In no instance was the biliary tract compromised or the liver extensively infiltrated by tumor. It is suggested that Hodgkin's disease be added to the differential diagnosis of patients with unexplained cholestatic jaundice.

0689 MEDICAL THERAPY FOR GALLSTONES.

(E.) Schoenfield, L. J. (Cedars-Sinai Med. Cent., Los Angeles, Calif.). *Gastroenterology* 67(4):725-729, 1974.

The current status of research efforts directed towards elucidating the pathogenesis of cholesterol gallstones, evaluating agents, especially chenodeoxycholic acids (CDC) for their dissolution, and defining high risk groups that are appropriate for prophylaxis are reviewed as well as the potential for the medical treatment of gallstones. The pathogenesis of pigment gallstones which account for 10% of all stones analyzed in U.S. differs from that of cholesterol gallstones which comprise 90% of U. S. stones (80% mixed cholesterol stones and 10% pure cholesterol). The bulk of the report, therefore, deals with cholesterol gallstones. In the first trial of CDC as a treatment for cholesterol cholelithiasis, the dose of CDC ranged from 1.5 to 4.5 g/day. Later trials used 750 mg/day but the lowest therapeutic dose has not yet been determined. Biliary bile acid and lipid composition return to pretreatment levels within 1 month of discontinuing therapy; gallstones recurred in 2/5 patients off therapy for 1 yr. After dissolution, therefore, continuous or intermittent prophylactic therapy is necessary. The mechanism whereby CDC induces desaturation of bile, and thereby gallstone dissolution, is still undergoing investigation. CDC may induce liver damage, diarrhea, and ductal obstruction. Dissolution treatment of gallstones with CDC is still experimental. Efficacy is virtually certain but safety remains to be shown in a large scale, cooperative therapeutic trial. Such a trial is scheduled to begin in January, 1975 for a 2-yr period involving 900 patients who will receive 1 of 2 doses of CDC or placebo at 10 U.S. centers.

0690 ENDOSCOPIC PAPILLOTOMY AND REMOVAL OF GALLSTONES: ANIMAL EXPERIMENTS AND PRELIMINARY CLINICAL RESULTS.

(Ger.) Demling, L.; Koch, H.; Classen, M.; Belohlavek, D.; Schaffner, O.; Schwamberger, K.; Stolte, M. (Med. Clin., Univ. Erlangen-Nuremberg, Erlangen, Germany). *Dtsch. Med. Wochenschr.* 99(45):2255-2257, 1974.

Endoscopic papillotomy and gallstone removal were performed in dogs and in 17 patients, including 3 cases of stenosis of the papilla of Vater, and 14 cases of cholelithiasis in the common bile duct. Transduodenal papillotomy was performed with a high-frequency diathermy catheter similar to that used for retrograde cholangiopancreatography, using a steel wire loop. The stones passed from the common bile duct spontaneously after 3 days, and they were easily extracted by means of Dormia's basket in another 5 cases. Endoscopic papillotomy, though primarily intended for elderly patients, is also indicated in younger patients, especially for repeated intervention after conventional operation.

0691 MULTIPLE BILIARY PAPILLOMATOSIS.

(E.) Madden, Jr., J. J.; Smith, G. W. (Univ. Virginia Sch. Med., Charlottesville). *Cancer* 34(4):1316-1320, 1974.

A case of multiple biliary papillomata with nuclear atypical changes involving the entire biliary duct system is presented. The patient, a 50-yr-old male, had undergone cholecystectomy for a nonfunctioning gallbladder 2 yr prior and had suffered from acute pancreatitis 3 months prior, followed by the development of obstructive jaundice. Upon exploration of the common bile duct, a spongy papillary tumor was removed. The patient subsequently underwent a left hepatic lobectomy for a tumor in the left hepatic duct system detected by a T-tube cholangiogram. Subsequent transhepatic cholangiography revealed a large recurrent tumor mass almost entirely obstructing the common bile duct at its midportion. A smaller tumor mass distally in the common bile duct was also observed along with obstruction secondary to papillomata in at least 1 duct of the right liver lobe and 1 duct of the caudate lobe. A large quantity of papillomatous material was removed from the common and intrahepatic bile ducts during an exploratory laparotomy, and a choledochoduodenostomy was then performed to allow for more adequate drainage. The patient subsequently had several attacks of cholangitis with obstruction secondary to tumor involvement of the common bile duct, as demonstrated on an upper gastrointestinal series, and was again relieved by curettage. Weekly treatments with 98 or 100 mg of 1,3-bis(2-choroethyl)-1-nitrosourea were successful in decreasing the tumor mass, but intermittent jaundice and cholangitis persisted. The patient died with *Bacteroides* septicemia and shock 5 yr after the initial diagnosis.

0692 BILIARY INFECTIONS AND THE CHOICE OF ANTIBIOTICS. *(E.)* Ram, M. D.; Gharavi, M. A. (Huron Road Hosp., Cleveland, Ohio). *Am. J. Gastroenterol.* 62(2):134-138, 1974.

In a prospective study of 200 patients (66 men and 134 women, ranging in age from 19-90 yr) undergoing cholecystectomy, gallbladder bile was obtained at surgery under sterile conditions and was plated immediately for culture. Of the 200 patients, 189 were operated on for cholecystitis (acute and/or chronic) and the remaining 11 for other lesions. In the whole group, 32% of the specimens yielded a positive growth; in those with acute cholecystitis 65% had a positive culture. The proportion of positive growths increased with age. Among patients with cholecystitis and gallstones only 27% had a positive bacterial growth, while in those with cholecystitis not associated with gallstones, 43% had a positive bacterial growth. *E. coli* was the most frequent organism isolated. Sensitivity of the organisms to a variety of antibiotics was studied by the disc sensitivity method and zones of inhibition were measured and compared to standards. It was found that kanamycin, gentamicin and colistin were effective against all organisms isolated.

0693 THE NATURE OF THE SERUM ALKALINE PHOSPHATASES IN LIVER DISEASES. *(E.)* Price, C. P.; Sammons, H. G. (East Birmingham Hosp., England). *J. Clin. Pathol.* 27(5):392-398, 1974.

Sera were obtained from 58 patients with extrahepatic biliary obstruction and from 20 control subjects; homogenized liver and intestine samples served as tissue controls. Hepatic bile was obtained from 12 patients after cholecystectomy. The main serum alkaline phosphatase isoenzyme migrated in polyacrylamide gel to a position equivalent to the liver tissue isoenzyme and in front of the bone isoenzyme. Another isoenzyme was found at the origin, contributing at least 20% to the total activity. Three additional isoenzyme bands were detected in much smaller quantities. The main serum isoenzyme on cellulose acetate electrophoresis was in the α_2-globulin region with a less prominent band in the α_1-globulin area; the latter fraction was not found in normal control serum. Gel filtration studies of patient sera showed 2 peaks of alkaline phosphatase activity equivalent to the 19S and 7S protein fractions. In the 8 samples studied there was a good correlation between the contribution of the 'origin' isoenzymes on electrophoresis and the 19S fraction, which ranged between 12 and 42% of the total activity. In samples of patient sera, ultracentrifugation gave 2 fractions of alkaline phosphatase activity, one in the 7S protein fraction and one floating at the top of the sucrose gradient. The floating fraction after ultracentrifugation on electrophoresis was found to correspond with the 'origin' isoenzymes previously observed. These results indicate that there is an abnormal isoenzyme in the serum from patients with extrahepatic biliary obstruction and that this isoenzyme is similar but not identical with the main bile enzyme. It is suggested that it may be associated with a lipoprotein carrier.

0694 EFFECT OF CHOLIC ACID FEEDING ON BILE ACID KINETICS AND NEUTRAL FECAL STEROID EXCRETION IN HYPERLIPOPROTEINEMIA (TYPES II AND IV). *(E.)* Einarsson, K.; Hellstrom, K.; Kallner, M. (Dep. Med., Serafim Hosp., Stockholm, Sweden). *Metabolism* 23 (9):863-874, 1974.

Bile acid kinetics and the fecal excretion of neutral steroids were characterized in 10 hyperlipemic patients (6 men and 4 women, ages 45-65 yr) before and after p.o. administration of 0.8-1.0 g cholic acid/day for 2-3 weeks. Prior to cholic acid feeding, the turnover of cholic acid in 5 patients (4 women and 1 man) with type II hyperlipoproteinemia (178 mg/day) was significantly less than that for 5 men with type IV lipoprotein patterns (700 mg/day). The 2 groups did not differ with regard to pool size and half-life of cholic acid or pool size, half-life, and turnover of chenodeoxycholic acid. Cholic acid administration to type II patients resulted in markedly elevated cholic acid pool size (from 818-3230 mg), though cholic acid half-life was unaffected. This change in pool size was associated with a decreased pool size and turnover of chenodeoxycholic acid (from 892-465 and from 170-93, resp.), a reduced serum cholesterol level (from 348-310 mg/100 ml), reduced serum triglycerides (from 291-253 mg/100 ml), and an increased excretion of neutral steroids in the feces (from 327-557 mg/day). In contrast only 3 of the subjects with type IV lipoprotein patterns displayed an increase cholic acid pool size, with the overall mean increase for the group being from 1174-1609 mg. Chenodeoxycholic acid turnover for the group fell from 278-163 mg/day. The fecal excretion of neutral steroids increased in all 5 (from 469-807 mg/day). Patients with types II and IV hyperlipoproteinemia appear to differ in their capacity to retain cholic acid, with type II patients having the ability to control chenodeoxycholic acid synthesis by feedback inhibition during p.o. administration of cholic acid. This latter ability may also be the case for type IV patients, though it was not significantly demonstrated in the present experiments.

0695 CHARACTERISTICS OF THE SHAPE OF THE PORTA HEPATIS IN RELATION TO THE SIZE OF THE LIVER. *(Ger.)* Bauer, J. A.; Hellerer, O. (Anat. Inst., Univ. Munich, Germany). *Munch. Med. Wochenschr.* 116(43):1881-1884, 1974.

The characteristics of the shape of the porta hepatis in relation to the size of the liver, the mode of junction of the hepatic duct, and the mode of division of the portal vein were investigated in 84 visceral sites in adults with and without hepatomegaly. The junction of the right and left hepatic ducts with the common hepatic duct corresponded to the size of the liver in 61 cases (73%), i.e., extrahepatic localization without hepatomegaly was found in 28 cases, and intrahepatic localization was found in 33 cases in hepatomegaly. The cystic duct joined with the common hepatic duct in 74 cases, and with the right hepatic duct in 6 cases. The branching of the portal vein was extrahepatic in 32 cases without hepatomegaly, and intrahepatic in 23 cases in hepatomegaly. The branching of the hepatic artery was extrahepatic in 46 cases without hepatomegaly, and intrahepatic in 7 cases in hepatomegalia. The extrahepatic junction of the right and left hepatic ducts with the common hepatic duct was always Y-shaped, while both Y-shaped and T-shaped junctions occurred in intrahepatic junction. The branching of both the portal vein and hepatic artery was Y-shaped both with and without hepatomegaly in the case of extrahepatic localization. The intrahepatic branching of the hepatic artery was Y-shaped both with and without hepatomegaly, while the intrahepatic branching of the portal vein was Y-shaped in 22 cases without hepatomegaly, in 15 cases with hepatomegaly, and T-shaped in 2 cases without hepatomegaly, and in 8 cases with hepatomegaly. The findings indicate that extrahepatic junctions and divisions are Y-shaped, and Y to T-shaped in hepatomegalia. The observations suggest that in hepatomegaly, the parenchyma pushes forward over the vessels and efferent bile ducts. The points of union or division penetrate deeper into the liver parenchyma, and their angles become more obtuse, approaching 180 degrees.

0696 COMPARISON OF ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY (ERCP) AND TRANSHEPATIC ANTEGRADE CHOLANGIOGRAPHY (THC) IN EVALUATING BILIARY STRICTURE. *(E.)* Wilkins, R.; Hatfield, A. (Northwick Park Hosp., Middlesex, England). *Digestion* 10(4/5):386-387, 1974.

0697 THE OPERATIVE CHOLANGIOGRAM: ITS INTERPRETATION, ACCURACY AND VALUE IN ASSOCIATION WITH CHOLECYSTECTOMY. *(E.)* McCormick, J. St. C.; Bremner, D. N.; Thomson, J. W. W.; McNair, T. J.; Philp, T. (R. Infirm., Edinburgh, Scotland). *Ann. Surg.* 180(6):902-906, 1974.

0698 ADENOCARCINOMA OF THE BILE DUCTS: RELATIONSHIP OF ANATOMICAL LOCATION TO CLINICAL FEATURES. *(E.)* Ingis, D. A.; Farmer, R. G. (Cleveland Clin. Found., Ohio). *Gut* 15(10):829-830, 1974.

0699 PAPILLOMA OF THE GALLBLADDER. REPORT OF A CASE. *(E.)* Kusakcioglu, O.; Aykam, T. B.; Kusakcioglu, A. (Beyoglu Insur. Hosp., Istanbul, Turkey). *Am. J. Gastroenterol.* 62(5):440-441, 1974.

0700 CLINICAL AND PATHOLOGICAL STUDY ON CHOLEDOCHOCYST. *(E.)* Suruga, K. (Juntendo Univ. Sch. Med., Tokyo, Japan). *Jpn. J. Surg.* 3(4): 119-203, 1973.

0701 INTERMITTENT JAUNDICE DUE TO A CARCINOMA OF THE AMPULLA OF VATER. *(E.)* Phatak, P. S. (Whittington Hosp., London, England). *Proc. R. Soc. Med.* 67(10):1025-1026, 1974.

0702 CARBOHYDRATE TOLERENCE AND INSULIN RESPONSES IN OBSTRUCTIVE JAUNDICE. *(E.)* Soler, N. G.; Exon, P. D.; Paton, A. (Dudley Road Hosp., Birmingham, England). *Br. Med. J.* 4(5942):447-449, 1974.

0703 IMMUNOGLOBULINS IN OBSTRUCTIVE JAUNDICE. *(Cz.)* Fucikova, T.; Mikulenkova, M. (1st Clin. Intern. Med., Charles Univ., Prague, Czechoslovakia). *Sb. Lek.* 75(9):268-271, 1973.

0704 BIOCHEMICAL COMPOSITION OF THE BILE IN PATIENTS WITH CALCULOUS CHOLECYSTITIS. *(Rus.)* Galkin, V. A.; Borisov, V. G.; Maksimov, V. A.; Maslova, T. N.; Kasilova, R. Z.; Levchuk, V. F. (I.M. Sechenov 1st Moscow Med. Inst., USSR). *Ter. Arkh.* 46(4):45-48, 1974.

0705 NORMAL ANTIPYRINE METABOLISM IN PATIENTS WITH CHOLESTEROL CHOLELITHIASIS. EVIDENCE THAT THE DISEASE IS NOT DUE TO GENERALIZED HEPATIC MICROSOMAL DYSFUNCTION. *(E.)* Hepner, G. W.; Vesell, E. S. (Pennsylvania State Univ. Coll Med., Hershey). *Am. J. Dig. Dis.* 20(1):9-12, 1975.

0706 THE NON-OPERATIVE REMOVAL OF RETAINED COMMON DUCT STONES AFTER BILIARY SURGERY. *(E.)* Semb, B. K. H.; Norderval, Y.; Halvorsen, J. F. (Haukeland Hosp., Univ. Bergen, Norway). *Acta Chir. Scand.* 140(6):469-474, 1974.

0707 PREVALENCE OF GALLSTONES IN RELATION TO DIFFERING TREATMENT RATES FOR BILIARY DISEASE. *(E.)* Opit, L. J.; Greenhill, S. (Med. Sch., Univ. Birmingham, England). *Br. J. Prev. Soc. Med.* 28(4):268-272, 1974.

0708 THE PRESENT POSITION CONCERNING GALLSTONE DISSOLUTION. *(E.)* Bell, G. D. (St. James' Hosp. London, England). *Gut* 15(11):913-929, 1974.

0709 RATE OF IN VITRO INCORPORATION OF PRECURSORS INTO HEPATIC LIPIDS AND PROTEINS IN PATIENTS WITH EXTRAHEPATIC CHOLESTASIS. *(E.)* Stakeberg, H.; Lundborg, H.; Schersten, T. (Sahlgrenska Hosp., Univ. Goteborg, Sweden). *Eur. J. Clin. Invest.* 4(6):399-403, 1974.

0710 PRIMARY SCLEROSING CHOLANGITIS. *(E.)* Oviedo, M. A.; Volkmer, D.; Scanlon, E. F. (Northwest. Univ. Med. Sch., Evanston, Ill.). *Arch. Surg.* 109(6):747-749, 1974.

0711 DETERRANTS TO SUCCESS OF HEPATIC PORTICO-ENTEROSTOMY FOR BILIARY ATRESIA. *(E.)* Lilly, J. R.; Altman, R. P.; Randolph, J. G. (Univ. Colorado Med. Cent., Denver). *Gastroenterology* 67(4):810, 1974.

0712 A CASE OF TRUE DIVERTICULUM OF THE GALLBLADDER IN A DIABETIC WOMAN: ETIOLOGY AND DIAGNOSIS. *(Fr.)* Rached-Mohassel, M. A.; Handjani, A. A.; Nik-Akhtar, B.; Bagheri, F.; Teymourian, G. A. (Pahlavi Univ. Hosp. Cent., Teheran, Iran). *Bord. Med.* 6(13):1975-1980, 1973.

0713 THE EFFECT OF DECREASED GALLBLADDER STIMULATION ON ENTEROHEPATIC CYCLING AND KINETICS OF BILE ACIDS. *(E.)* Hepner, G. W. (Milton S. Hershey Med. Cent., Hershey, Pa.). *Gastroenterology* 67(4):797, 1974.

0714 VASCULAR INFLUENCES ON THE DYNAMIC STABILITY OF THE CHOLEDOCHODUODENAL JUNCTION. *(E.)* Tansy, M. F.; Innes, D. L.; Martin, J. S.; Kendall, F. M. (Temple Univ. Health Sci. Cent., Philadelphia, Pa.). *Am. J. Dig. Dis.* 19(12):1124-1137, 1974.

0715 PHARMACOLOGY OF CEPHALOTHIN IN THE BILIARY TRACT OF HUMANS. *(E.)* Mendelson, J.; Portnoy, J.; Sigman, H.; Dick, V. (Jewish Gen. Hosp., Montreal, Canada). *Antimicrob. Agents Chemother.* 6(6):659-665, 1974.

See also, 0034, 0118, 0335, 0366, 0384, 0385, 0440, 0460, 0524, 0545, 0572, 0573, 0581, 0589, 0591, 0592, 0594, 0651, 0671.

GENERAL

0716 THE LIVER IN KWASHIORKOR. *(E.)* Webber, B. L.; Freiman, I. (Dep. Pathol., Univ. Cape Town, South Africa). *Arch. Pathol.* 98(6):400-408, 1974.

A study to determine the correlation between the hepatomegaly of kwashiorkor and the pathologic changes at the cellular level was undertaken in 22 children (13 boys and 9 girls, 8 months-6 yr). All cases had the typical features of the disease; 14 children had abnormal irritability, lethargy, stupor or coma, but the other 8 were fully conscious. Clinical or biochemical jaundice appeared associated with more severe encephalopathy. Severe hypoglycemia was present in 3 children and 2 of these had seizures, which were considered a rather unusual feature. In the 6 cases with anemia, 2 had hemoglobin levels of 2.7 and 4.6 g/100 ml and exhibited purpura and subcutaneous hemorrhages. Serum protein levels were low in all cases (mean total protein 4.4 g/100 ml standard deviation 0.6 g/100 ml). Liver specimens from needle biopsy were fixed, and sections were cut to include parenchymal cells near portal tracts as well as near terminal hepatic veins. With light microscopy, all sections showed severe panlobular fatty metamorphosis, the cells being greatly distended by large lipid vacuoles which pushed the nuclei to a side; membranes between vacuoles and cell membranes appeared to be ruptured forming large cysts. Electron microscopy showed that hepatocytes in centrilobular and periportal areas exhibited similar large vacuoles in all cells with minimal electron density and without visible membranes, corresponding to the lipid vacuoles described above. Increase in size and number of lysosomes (thought to represent phospholipid) was noted in the hepatocytes, their highest concentration being around the bile canaliculi where they appeared to form an integral part of a group of organelles including many mitochondria, these last showing little abnormality. The nuclei exibited few abnormalities except being molded by the adjacent vacuoles and the nucleoli were larger then normal. Cell membranes appeared unremarkable. Three cases showed "alcoholic hyalin" (a finding which had been described before), and a mild increase of collagen adjacent to hepatocytes was noted, but did not appear to be of practical consequence. The changes in the liver parenchymal cells observed by electron microscopy were surprisingly mild and no relation with the degree of encephalopathy could be established.

0717 AN EXPERIMENTAL STUDY OF ACUTE NEONATAL ENTEROCOLITIS - THE IMPORTANCE OF BREAST MILK. *(E.)* Barlow, B.; Santulli, T. V.; Heird, W. C.; Pitt, J.; Blanc, W. A.; Schullinger, J. N. (Coll. Physicians Surg., Columbia Univ., New York, N.Y.). *J. Pediatr. Surg.* 9(5):587-595, 1974.

A model of necrotizing enterocolitis was designed using Sprague-Dawley rats. Rats were either fed with rat breast milk or with a formula which simulated rat milk and was composed of 6.0 g/100 ml protein, 10.0 g/100 ml fat, 9.6 g/100 ml carbohydrate, 1.2 g/100 ml ash and 152 calories/100 ml. Without hypoxia, all rats that were breast or formula fed, with or without *Klebsiella* contamination, remained healthy. When hypoxia was introduced, with or without contamination, all breast-fed animals remained healthy, while all formula-fed rats died at 2-5 days of age with preceding delayed gastric emptying, gaseous abdominal distention, diarrhea usually with occult or gross blood, lethargy, poor feeding, and cyanosis. The bowel was grossly necrotic and hemorrhagic at postmortem, and distended with gas with or without perforation and pneumoperitoneum. The intestines appeared normal at 12 and 24 hr with gaseous distention occurring at 36 hr, initially limited to the ileum and later involving the entire intestine. Histologically, the intestines of breast-fed animals were normal. Intestines of formula-fed rats showed dilatation with flattening of mucosal villi, then marked atrophy of villi with depletion of mucus in villous epithelium, and finally small ulcerations and bacterial invasion of the wall progressing in some to total necrosis. Stool cultures of breast-fed animals showed light or no growth of gram-negative organisms. Peritoneal and stool cultures of contaminated formula-fed rats had heavy *Klebsiella* growth, whereas those of the uncontaminated group showed heavy *Escherichia coli* growth. In rats subjected to daily hypoxia and *Klebsiella* contamination and fed either breast milk or formula for 24, 48, or 72 hr and then switched to the alternative feeding, all rats initially breast fed remained healthy. However, all rats fed formula for either 48 or 72 hr and then switched to breast milk died. In animals pretreated with immune globulin, all breast fed animals remained healthy and only 40% of the formula-fed rats developed the disease. Survivors had normal intestines at sacrifice. Stool samples had moderate growth of *E. coli*. In animals pretreated with Lactinex, disease incidence was also 40%; survivors had gaseous bowel distention and heavy fecal growth of *Klebsiella*. All rats pretreated with neomycin died. It was concluded that, through induction of passive enteric immunity and control of intestinal flora, breast milk may protect at-risk premature infants from acute enterocolitis.

0718 STUDY OF DYSPEPSIA IN A GENERAL PRACTICE AS ASSESSED BY ENDOSCOPY AND RADIOLOGY. *(E.)* Barnes, R. J.; Gear, M. W. L.; Nicol, A.; Dew, A. B. (Gloucestershire R. Hosp., Gloucester, Scotland). *Br. Med. J.* 4(5938):214-216, 1974.

A total of 50 patients (33 men and 17 women) presented with dyspepsia during a 6-month period and were studied by a combination of barium-meal examination and endoscopy. Each patient had suffered at least 1 of the following symptoms for more than 2 weeks: upper abdominal pain or discomfort related to food; retrosternal or upper abdominal pain related to posture; pain relieved by alkalis or vomiting; or pain experienced at night. On barium-meal examination 3 patients had gastric ulcers, 18 had pyloroduodenal disease, and 8 had hiatus hernia. The remaining 21 were normal. Endoscopic examination showed 30 patients with specific lesions of the esophagus, stomach, or duodenum. Three had gastric ulcers, none of which had been reported on barium-meal examination. One patient had a carcinomatous ulcer which had been reported on barium-meal exam as benign. Duodenal ulceration was noted in 11 patients and pyloroduodenal scarring without active ulceration in a further 12. In 4 patients in whom endoscopy showed pyloroduodenal deformity or ulceration, barium-meal examination had shown a hiatus hernia without any other lesion. There were also 2 patients with hiatus hernia and 1 with benign stricture of the esophagus with ulceration. Of the remaining 20 patients, 9 had inflammatory mucosal changes in the absence of specific lesions, and in 3 of these atrophic gastritis was found on histological examination. Endoscopic findings were normal in only 11. On cholecystography, 3 patients had gallstones and 3 a non-functioning gallbladder. Cholecystography failed in 1 patient, 1 had had a previous cholecystectomy, and function was normal in the remaining 42. Therefore, it is concluded that many patients with dyspepsia are receiving inadequate therapy, for underlying lesions have remained undiagnosed. It is suggested that endoscopy subsequent to the initial screening by a combined barium-meal examination with cholecystogram in selected patients will provide the most accurate diagnostic approach to the problem of dyspepsia.

0719 GASTROINTESTINAL DISORDERS. *(E.)* Paton, A. (Dudley Road Hosp., Birmingham, England). *Br. Med. J.* 4(5943):522-524, 1974.

0720 MEMORIAL LECTURE: THE PSYCHOSOMATIC APPROACH TO INDIVIDUAL SUSCEPTIBILITY TO DISEASE. *(E.)* Engel, G. L. (Univ. Rochester, Sch. Med. Dent., N.Y.). *Gastroenterology* 67(6):1085-1093, 1974.

0721 WATER, ELECTROLYTE AND ACID-BASE DISORDERS IN GASTROENTEROLOGY: THERAPEUTIC CONSIDERATIONS. *(E.)* Caprilli, R.; Carratu, R. (2nd Med. Clin., Univ. Rome, Italy). *Rend. Gastroenterol.* 6(2):121-131, 1974.

0722 CELLULAR IMMUNITY IN ENTERIC DISEASE. *(E.)* Collins, F. M.; Carter, P. B. (Trudeau Inst., Inc., Saranac Lake, N.Y.). *Am. J. Clin. Nutr.* 27(12):1424-1433, 1974.

0723 GASTROGENIC AND PANCREATOGENIC GASTROINTESTINAL INSUFFICIENCY. *(Ger.)* Zastrow, R. (Clin. Intern. Med., Univ. Rostock, Germany). *Z. Gesamte Inn. Med.* 29(22):936-940, 1974.

0724 EVOLUTION OF AND PROSPECTS FOR HEPATOLOGY AND GASTROENTEROLOGY. *(Fr.)* Bernier, J. J. (Lariboisiere Hosp., Paris, France). *Prog. Med.* 101(8):331-335, 1973.

0725 TREATMENT OF GASTROINTESTINAL INSUFFICIENCY WITH A COMBINATION OF A CHOLERETIC AND DIGESTIVE ENZYMES. *(It.)* Pietranera, P.; Rucci, R. (Dep. Med. Semeiotics, Univ. Parma, Italy). *Gaz. Med. Ital.* 132(10):517-520, 1973.

0726 CONGENITAL POSITIONAL ANOMALIES OF THE GASTROINTESTINAL TRACT AND THE EMBRYOLOGICAL MECHANISM INVOLVED: THREE CASES. *(Sp.)* Duaso Padin, R. (Concepcion Arenal Diagn. Treat. Cent., Santiago de Compostela, Spain). *Rev. Esp. Enferm. Apar. Dig.* 44(3):267-274, 1974.

0727 SUCROSE INTOLERANCE. *(Ger.)* Madzarovova-Nohejlova, J. (1st Med. Clin., Charles Univ., Plzen, Czechoslovakia). *Z. Gesamte Inn. Med.* 29(23):985-987, 1974.

0728 INTESTINAL, SALIVARY, AND SERUM IMMUNOGLOBULINS IN A GROUP OF CHILDREN WITH RECURRENT INTESTINAL AND RESPIRATORY INFECTIONS. *(Fr.)* Burnier, M. J.; Nussle, D.; Girard, J. P; Megevand, A. (no affil.). *Helv. Paediatr. Acta* 33(suppl.):25, 1974.

0729 COMPARISON OF BIOREACTIVE AND IMMUNOREACTIVE GASTRIN. *(E.)* Hansky, J; Royle, J. P.; Korman, M. G. (Dep. Med., Monash Univ., Melbourne, Australia). *Aust. J. Exp. Biol. Med. Sci.* 52(5): 841-846, 1974.

0730 CORRELATION BETWEEN ACID AND PEPSIN SECRETION OF THE STOMACH UNDER PHYSIOLOGICAL AND PATHOLOGICAL CONDITIONS. *(E.)* Bonfils, S. (Bichat Hosp., Paris, France). *Rend. Gastroenterol.* 6(1): 65-73, 1974.

0731 TREATMENT OF DYSPEPTIC SYNDROMES WITH DISKILENE. *(Sp.)* Garcia Perez, M. (Hermanos Aznar Outpatient Clin., Madrid, Spain). *Rev. Esp. Enferm. Apar. Dig.* 44(2):187-192, 1974.

0732 PARENTERAL HYPERALIMENTATION - FIVE YEARS' CLINICAL EXPERIENCE. *(E.)* Myers, R. N.; Smink, Jr., R. D.; Goldstein, F. (Lankenau Hosp., Philadelphia, Pa.). *Am. J. Gastroenterol.* 62(4): 313-324, 1974.

0733 THE RADIOLOGIC MANIFESTATIONS OF HENOCH-SCHOENLEIN PURPURA. *(E.)* Macpherson, R. I. (Child. Hosp., Winnipeg, Canada). *J. Can. Assoc. Radiol.* 25(4):275-278, 1974.

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0739 ISCHEMIC GASTROINTESTINAL LESIONS IN THE NEONATE. *(E.)* Touloukian, R. J. (Yale Univ. Sch. Med., New Haven, Conn.). *Paediatrician* 3(3-5):230-236, 1974.

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0743 VALUE AND LIMITATIONS OF DETERMINING BLOOD GASTRIN IN THE DIAGNOSIS OF ZOLLINGER-ELLISON'S SYNDROME. *(Fr.)* Bernades, P.; Bonfils, S. (Bichat Hosp., Paris, France). *Arch. Fr. Mal. App. Dig.* 63(4):265-268, 1974.

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0746 UPPER GASTROINTESTINAL BLEEDING. *(E.)* Patterson, M. (Univ. Texas Med. Branch, Galveston). *J. Miss. State Med. Assoc.* 15(11): 469-475, 1974.

0747 HEMORRHAGE OF THE UPPER GASTROINTESTINAL TRACT IN HEMATOLOGICAL DISEASES. *(Sp.)* Perez Carnero, A.; Montero Garcia, J. M.; Muro, J.; Hita Perez, J.; Cano Lopez, J. M. (La Paz Soc. Welfare Polyclin., Free Univ., Madrid, Spain). *Rev. Esp. Enferm. Apar. Dig.* 44(2):141-156, 1974.

0748 RADIOLOGICAL DIAGNOSIS OF BLEEDING FROM THE ESOPHAGUS, STOMACH, OR DUODENUM. *(Ger.)* Bucheler, E. (Radiol. Clin., Univ. Bonn, Germany). *Langenbecks Arch. Chir.* 337:497-503, 1974.

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0751 ACUTE VIRAL GASTROENTERITIS. *(E.)* Kapikian, A. Z. (Natl. Inst. Allergy Infect. Dis., Bethesda, Md.). *Prev. Med.* 3(4):535-542, 1974.

0752 THE MANAGEMENT OF ACUTE DIARRHEA IN INFANTS. *(Fr.)* Moreno, J. L. (no affil.). *Gaz. Med. France* 80(37):6147-6156, 1973.

0753 DEFINITION AND DISTINGUISHING CRITERIA OF DIARRHEA. *(Ger.)* Koelsch, K. A. (Magdeburg-Altstadt Reg. Hosp., Germany). *Z. Gesamte Inn. Med.* 29(14):591-594, 1974.

0754 ACUTE DIARRHEA IN A RESIDENTIAL INSTITUTION FOR THE RETARDED: USEFULNESS OF FECAL LEUKOCYTE EXAMINATION. *(E.)* Pierce, J. E.; DuPont, H. L.; Lewis, K. R. (Univ. Texas Health Sci. Cent., Houston). *Am. J. Dis. Child.* 128(6):772-775, 1974.

0755 DIARRHEA ASSOCIATED WITH RIGHT HEMICOLECTOMY: PHYSIOPATHOLOGICAL CONCEPTS AND THERAPEUTIC DEDUCTIONS BASED ON 6 CASES. *(Fr.)* Gendre, J. P.; Le Quintrec, Y. (Albert Chenevier Hosp., Creteil, France). *Nouv. Presse Med.* 3(34):2149-2152, 1974.

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0757 CHOLERA. *(E.)* Carpenter, C. C. J. (Univ. Hosp., Cleveland, Ohio). *Prev. Med.* 3(4): 456-460, 1974.

0758 COMPARISON OF THE EFFECTS OF ENTEROTOXINS OF Shigella dysenteriae AND Vibrio cholerae ON THE ADENYLATE CYCLASE SYSTEM OF THE RABBIT INTESTINE. *(E.)* Flores, J.; Grady, G. F.; McIver, J.; Witkum, P.; Beckman, B.; Sharp, G. W. G. (Massachusetts Gen. Hosp., Boston). *J. Infect. Dis.* 130(4): 374-379, 1974.

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0760 ROLE OF HOUSEHOLD ANIMALS IN MAINTENANCE OF CHOLERA INFECTION IN A COMMUNITY. *(E.)* Sanyal, S. C.; Singh, S. J.; Tiwari, I. C.; Sen, P. C.; Marwah, S. M.; Hazarika, U. R.; Singh, H.; Shimada, T.; Sakazaki, R. (Inst. Med. Sci., Banaras Hindu Univ., Varanasi, India). *J. Infect. Dis.* 130(6):575-579, 1974.

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0764 CHOLERA-LIKE TOXIC EFFECT OF CULTURE FILTRATES OF Escherichia coli. *(E.)* Nalin, D. R.; Bhattacharjee, A. K.; Richardson, S. H. (Bowman Gray Sch. Med., Wake Forest Univ., Winston-Salem, N.C.). *J. Infect. Dis.* 130(6):595-601, 1974.

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0766 IN VIVO PRODUCTION AND INACTIVATION OF Escherichia coli ENTEROTOXIN. *(E.)* Donta, S. T.; Moon, H. W.; Whipp, S. C.; Skartvedt, S. M. (Dep. Med., Univ. Iowa, Iowa City). *Gastroenterology* 67(5):983-990, 1974.

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0768 THE VALUE OF TRIMETHOPRIM-SULFAMETHOXAZOLE IN THE TREATMENT OF SALMONELLA INFECTIONS. *(E.)* Lurie, I.; Felner, S.; Burke, M. (Ichilov Munic. Gov. Hosp., Tel Aviv, Israel). *Isr. J. Med. Sci.* 10(11):1420-1424, 1974.

0769 CURRENT INCIDENCE OF INTESTINAL SALMONELLOSIS IN A CHILDREN'S HOSPITAL IN PARIS. *(Fr.)* Laplane, R.; Begue, P.; Omanga, U.; Rizo, O. (no affil.). *Bull. Acad. Natl. Med. (Paris)* 158(3): 238-241, 1974.

0770 EPIDEMIOLOGY OF Salmonella Typhi INFECTION IN A MIGRANT LABOR CAMP IN DADE COUNTY, FLORIDA. *(E.)* Feldman, R. E.; Baine, W. B.; Nitzkin, J. L.; Saslaw, M. S.; Pollard, Jr., R. A. (Dade Cty. Dep. Public Health, Miami, Fla.). *J. Infect. Dis.* 130(4):334-342, 1974.

0771 IMMUNOLOGICAL STUDY OF TYPHOID: IMMUNOGLOBINS, C_3, ANTIBODIES, AND LEUKOCYTE MIGRATION INHIBITION IN PATIENTS WITH TYPHOID FEVER AND TAB-VACCINATED INDIVIDUALS. *(E.)* Kumar, R.; Malaviya, A. N.; Murthy, R. G. S.; Venkataraman, M.; Mohapatra, L. N. (All-India Inst. Med. Sci., New Delhi). *Infect. Immun.* 10(6):1219-1225, 1974.

0772 THE RELATION BETWEEN INSULIN SECRETION GLUCOSE TOLERANCE, GROWTH HORMONE, AND SERUM PROTEINS IN PROTEIN-CALORIE MALNUTRITION. *(E.)* Becker, D. J.; Pimstone, B. L.; Hansen, J. D. L. (Dep. Pediatr. Child Health, Univ. Cape Town, South Africa). *Pediatr. Res.* 9(1):35-39, 1974.

0773 PATTERNS OF PROTEIN-ENERGY MALNUTRITION IN EARLY CHILDHOOD IN JORDAN. *(E.)* Hijazi, S. S. (Ashragieh Hosp., Amman, Jordan). *Am. J. Clin. Nutr.* 27(11):1254-1258, 1974.

0774 EFFECT OF MALNUTRITION ON COLONIC HEALING. *(E.)* Irvin, T. T.; Hunt, T. K. (Dep. Surg., Univ. Leeds, England). *Ann. Surg.* 180(5):765-772, 1974.

0775 BASAL CELL ADENOMA OF THE SALIVARY GLANDS. *(E.)* Thawley, S. E.; Ward, S. P.; Ogura, J. H. (Washington Univ. Sch. Med., St. Louis, Mo.). *Laryngoscope* 84(10):1756-1766, 1974.

0776 AN ULTRASTRUCTURAL STUDY OF ADENOID CYSTIC CARCINOMA OF THE HUMAN SALIVARY GLAND. *(E.)* Panicker, K. N. S.; Potdar, G. G.; Sirsat, S. M. (Cancer Res. Inst., Bombay, India). *Indian J. Cancer* 11(2):168-176, 1974.

0777 BENIGN LYMPHOEPITHELIAL LESIONS OF THE SALIVARY GLANDS. *(E.)* Kelly, D. R.; Spiegel, J. C.; Maves, M. (Ohio State Univ. Coll. Med., Columbus). *Arch. Otolaryngol.* 101(1):71-75, 1975.

0778 HEPATIC INVOLVEMENT IN SJOGREN'S SYNDROME. *(E.)* Lopes, J. D.; Acras, S.; Borini, P.; De Moraes-Filho, J. P. P.; Bettarello, A. (Sao Paulo Med. Sch., Univ. Sao Paulo, Brazil). *Acta Gastroenterol. Latinoam.* 6(1):1-5, 1974.

0779 PAROTIDITIS DURING CAT SCRATCH DISEASE. *(Fr.)* Laudenbach, P.; Harar, E.; Hallard, M.; Gros, F. (Corentin-Celton Hosp., Issy-les-Moulineaux, France). *Nouv. Presse Med.* 3(28):1753-1754, 1974.

See also, 0341, 0342, 0344, 0345, 0346, 0348, 0370, 0374, 0438.

GENERAL

Parasitology

0780 GASTROINTESTINAL PROTEIN LOSS IN HOOKWORM AND ROUNDWORM INFECTIONS. *(E.)* Gupta, M. C.; Basu, A. K.; Tandon, B. N. (All India Inst. Med. Sci., New Delhi). *Am. J. Clin. Nutr.* 27:1386-1389, 1974.

Gastrointestinal protein loss was studied using ^{51}Cr-albumin in 11 patients (10 males and 1 female, aged 15-16 yr) having mild hookworm and/or roundworm infection. Of these, 7 had pure hookworm infection and 4 had combined infection. The dietary history was not investigated in detail; all consumed mainly a cereal-legume based diet with minimal quantities of milk and other animal protein. All patients were hospitalized for the study and given a diet of about 2,200 kcal, 50 g protein and 100 g fat/day with added vitamins. The main clinical presentation was asthenia, fatigue, vague abdominal pain, and bowel disturbance characterized by incomplete evacuation with or without passage of unformed stools. Only mild infection was noted with ova counts ranging from 33-1,340 eggs/g for hookworm and 29-983 eggs/g for roundworm. Gastrointestinal protein loss in terms of 96-hr fecal excretion of ^{51}Cr was less than 0.75% in 2 control subjects. All except 1 patient had gastrointestinal protein loss below the upper limit of normal. The 1 patient with increased gastrointestinal protein loss had pure hookworm infection; this patient also had the highest ova count in the series. No difference was noted regarding gastrointestinal protein loss between pure hookworm infection and mixed hookworm and roundworm infection. Derangement of absorption of D-xylose was present in 3 of the 7 patients with hookworm infection and in 2 of the 4 patients with mixed hookworm and roundworm infections. It is concluded that the malabsorption recorded in patients with hookworm disease is related to associated protein malnutrition rather than worm infection.

0781 Schistosomiasis mansoni IN YEMENI IN CALIFORNIA: DURATION OF INFECTION, PRESENCE OF DISEASE, THERAPEUTIC MANAGEMENT. *(E.)*

Warren, K. S.; Mahmound, A. A. F.; Cummings, P. Murphy, D. J.; Houser, H. B. (Case Western Reserve Univ. Sch. Med., Cleveland, Ohio). *Am. J. Trop. Med. Hyg.* 23(5):902-909, 1974.

Of 218 Yemeni agricultural workers in the San Joaquin Valley of California, 122 (56%) had *Schistosoma mansoni* eggs in their stools. Quantitative egg counts with the Kato thick smear method showed that 57% of those infected had light infections (1-100 eggs/g), 27% moderate infections (101-400 eggs/g), and 16% heavy infections (>400 eggs/g; mean 918 eggs/g). The time away from Yemen varied from 2 months to 20 yr, a period in which the prevalence of schistosomiasis had remained constant in Yemen. In those away for less than 5 yr the prevalence of schistosomiasis was 59% with a mean egg output of 236 eggs/g; in those away for more than 5 yr the prevalence was 32% with a mean egg output of 65 egg/g, despite the fact that 75% of the latter had returned to Yemen for short visits. Results of Fisher's exact probability test showed that the lower egg output in those away from Yemen more than 5 yr was statistically significant. On the basis of these findings the mean life span of the Yemeni strain of *S. mansoni* in man was estimated to be 5-10 yr. There were no differences in symptoms, such as weakness, diarrhea, and abdominal pain, between the uninfected proportion of the population, total infected group, and the heavily infected subgroup. None of the patients had hepatomegaly and only 2 had splenomegaly (1 lightly and the other heavily infected). Because of the toxicity of antischistosomal drugs and the lack of treatment facilities, only the 22 most heavily infected patients were treated with niridazole (12.5 mg/kg twice/day for 7 days, p.o.). Side effects (e.g., headache, 64%; nausea and/or vomiting, 67%; dizziness, 41%) were common with niridazole but were not severe. Mean egg production in 9 workers followed for 3-7 months was reduced by 97%. The 2 patients with splenomegaly were given stibocaptate (200 mg/week for 5 weeks, i.m.).

0782 A CONTROLLED STUDY OF MORBIDITY OF Schistosomiasis mansoni IN ST. LUCIAN CHILDREN, BASED ON QUANTITATIVE EGG EXCRETION. *(E.)*

Cook, J. A.; Baker, S. T.; Warren, K. S.; Jordan, P. (Res. Control Dep., Minist. Health, Castries, St. Lucia, West Indies). *Am. J. Trop. Med. Hyg.* 23(4):625-633, 1974.

Morbidity due to schistosomiasis was studied among 75 St. Lucian school children (aged 7-16 yr) who were heavily infected (400 or more eggs/ml feces), moderately infected (100-300 eggs/ml), or lightly infected (10-75 eggs/ml) with *Schistosomiasis mansoni*; 56 uninfected children served as controls. Among the uninfected group, 32 were found during the study to have become lightly infected. The groups were comparable with respect to sex, the heavily infected children being somewhat older than the uninfected children. Gastrointestinal symptoms were relatively frequent among all groups, the frequency being independent of infection with *S. mansoni*. The groups did not differ in terms of anthropometric measurements. Hepatomegaly and splenomegaly were significantly more frequent in the heavy-moderate infection groups, and extension of the liver below the costal margin increased with the intensity of infection. The serum globulin level and degree of skin-test reactivity were directly related to the intensity of infection, while the serum albumin level was inversely related. Infection with *S. mansoni* did not result in disease in most of the children investigated.

0783 PLEURAL EMPYEMA DUE TO RUPTURED AMOEBIC LIVER ABSCESS. *(E.)*

Rasaretnam, R.; Paul, A. T. S.; Yoganathan, M. (Colombo Gen. Hosp., Ceylon). *Br. J. Surg.* 61(9):713-715, 1974.

The clinical features and treatment regimens of 31 patients with empyema secondary to ruptured amebic liver abscess are presented. The diagnosis was initially established by chest x-ray and was confirmed in each case by aspiration of typical "chocolate sauce" pus from the pleural cavity. The empyema fluid was positive for amebae in only 1 case. Treatment consisted of pleural drainage by intercostal catheter in 27 patients, 3 of whom died due to poor general condition. Fourteen subsequently underwent decortication; 1 death in this group was of a severely jaundiced patient. Another 3 underwent primary decortication while the final patient died suddenly during aspiration, possibly due to a reaction to the local anesthetic. All but 2 patients were male. Symptoms, which included chest pain, fever, cough, and abdominal pain, were less than 4 weeks duration in 18 of the 31 patients. All had symptoms of pleural effusion and 15 had intercostal tenderness and 14 had hepatomegaly. Only 2 patients were jaundiced; 15 had anemia (Hgb < 10 gm%). Mean white cell count was 15,333/ml and erythrocyte sedimentation rate was elevated in 24 of 25 patients tested. Secondary infection with pyogenic organisms occurred in one-third of the cases.

0784 PARASITOLOGIC INVESTIGATIONS IN GASTROENTEROLOGIC PRACTICE. *(E.)* Mantell, C. A.; Yoeli, M. (St. Vincent's Med. Cent., New York, N.Y.). *NY State J. Med.* 75(1):39-43, 1975.

0785 PROTOZOAL DISEASES ENDEMIC IN THE UNITED STATES. THE TEACHING OF PARASITOLOGY AS DETERMINED BY ENDEMIC PROTOZOAL DISEASES. *(E.)* Neva, F. A. (Natl. Inst. Allergy Infect Dis., Bethesda, Md.). *Am. J. Trop. Med. Hyg.* 23(4):731-735, 1974.

0786 GIARDIASIS: A COMMON CAUSE OF PROLONGED DIARRHOEA IN ADULTS. *(E.)* Heap, T. (North Shore Med. Cent., St Leonards, Australia). *Med. J. Aust.* 2(16):592-595, 1974.

0787 IMMUNODIAGNOSTIC TESTS FOR BILHARZIASIS. II. REACTIVITY OF VARIOUS SCHISTOSOME ANTIGENS IN DIFFERENT SEROLOGICAL TESTS. *(E.)* Umaly, R. C.; Oelerich, S., Haas, J. (Bernard-Nocht Inst. Ship, Trop. Dis., Hamburg, Germany). *Tropenmed. Parasitol.* 25(4):413-421, 1974.

0788 IMMUNODIAGNOSTIC TESTS FOR BILHARZIASIS. III. SERODIAGNOSIS OF Schistosoma haematobium INFECTION AND INFLUENCE OF CHEMOTHERAPY ON IMMUNODIAGNOSTIC TESTS. *(E.)* Umaly, R. C.; Oelerich, S.; Haas, J. (Bernard-Nocht Inst. Ship, Trop. Dis., Hamburg, Germany). *Tropenmed. Parasitol.* 25(4):422-432, 1974.

0789 EXPULSION OF Nippostrongylus brasiliensis FROM THE INTESTINE OF RATS: ATTEMPTS TO INITIATE WORM EXPULSION BY CELL TRANSFER IN AN IMMUNOLOGICALLY INERT ALLOGENEIC ENVIRONMENT. *(E.)* Kelly, J. D.; Love, R. J.; Dineen, J. K. (Dept. Vet. Pathol., Univ. Sydney, Australia). *Int. Arch. Allergy Appl. Immunol.* 46(6):880-893, 1974.

0790 NECROTIC AMEBIC COLITIS. *(E.)* Cutler, D.; Avendano, E.; Maldonado, P.; Acosta, M. (Fac. Med., Natl. Auton. Univ., Mexico City, Mexico). *Am. J. Gastroenterol.* 62(4):345-349, 1974.

0791 INTESTINAL AMEBIASIS. RADIOLOGICAL AND SURGICAL ASPECTS. *(E.)* Balikian, J. P.; Nahra, K. S.; Uthman, S. M. (Dep. Radiol., Am. Univ. Beirut, Lebanon). *J. Med. Liban.* 27(4):413-423, 1974.

0792 TINIDAZOLE IN SYMPTOMATIC INTESTINAL AMOEBIASIS. *(E.)* Prakash, C.; Bansal, B. C.; Bansal, M. R. (Med. Coll., Rohtak, India). *J. Trop. Med. Hyg.* 77(7):165-167, 1974.

0793 COMPARATIVE TRIAL OF TINIDAZOLE AND METRONIDAZOLE IN INTESTINAL AMEBIASIS. *(E.)* Misra, N. P.; Laiq, S. M. (Gandhi Med. Coll., Bhopal, India). *Curr. Ther. Res.* 16(12):1255-1263, 1974.

0794 THE USE OF MEBENDAZOLE AS A BROAD-SPECTRUM ANTHELMINTIC IN RHODESIA. *(E.)* Goldsmid, J. M. (Dep. Med. Microbiol., Univ. Rhodesia, Salisbury). *S. Afr. Med. J.* 48(54):2265-2266, 1974.

0795 ANTHELMINTIC ACTIVITY OF MEBENDAZOLE AGAINST Cysticercus fasciolaris. *(E.)* Thienpont, D.; Vanparijs, O.; Hermans, L. (Dep. Chemother., Janssen Pharm., Beerse, Belgium). *J. Parisitol.* 60(6):1052-1053, 1974.

0796 CASE REPORT. AMOEBIC PERICARDITIS. *(E.)* Faerber, E. N.; Segal, F.; Sischy, N. L. (Baragwanath Hosp., Johannesburg, South Africa). *Br. J. Radiol.* 47(563):816-818, 1974.

0797 HEPATIC AMEBIASIS IN 1973. *(Fr.)* Cenac, A. (Paris Hosp., France). *Gaz. Med. France* 80(34):5561-5576, 1973.

0798 REPEATED ANTICHOLERA VACCINATIONS AND THEIR IMMUNOSUPPRESSIVE EFFECT LEADING TO THE DEVELOPMENT OF HEPATIC AMEBIASIS. *(Fr.)* Bastin, R.; Charmot, G.; Calamy, G.; Baudet, M. (Claude Bernard Hosp., Paris, France). *Ann. Med. Interne* 125(6/7):513-518, 1974.

0799 SURGICAL TREATMENT OF PARASITIC DISEASES OF THE LIVER. *(Fr.)* Rohner, A. (Surg. Clin., Univ. Geneva, Switzerland). *Helv. Chir Acta* 41(5/6):665-674, 1974.

See also, 0211, 0378, 0567, 0601, 0762.

GENERAL

Regional Enteritis

0800 AN EVALUATION OF THE ROSETTE INHIBITION TEST IN CROHN'S DISEASE. *(E.)* Clarke, J. R.; Richens, E. R.; Williams, M. J.; Gough, K. R.; Ancill, R. J. (R. United Hosp. (North), Bath, England). *Gut* 15(9):725-727, 1974.

Serial rosette inhibition tests were performed on 9 patients (4 females and 5 males, aged 16-71 yr) with Crohn's disease lasting from 1-22 yr, who were undergoing immunosuppressive therapy. In 23 normal subjects tested, the mean minimum inhibitory concentration for the group was 24.3. Age slightly affected the endpoint; sex did not. When phosphate-buffered saline (pH 7.35) was used in the incubation medium (30 cases), the percentage of rosette-forming cells was 25.1. When Hank's solution was used (37 cases) this number fell to 11.2. However, the minimum inhibitory concentration was not affected by the percentage of rosette-forming cells. The minimum inhibitory concentration was 24.8 with phosphate-buffered saline and 24.1 with Hank's solution. When not on immunosuppression therapy, the patients in an active phase of the disease showed a significantly lower minimum inhibitory concentration than those patients with inactive disease who gave results close to the normal range. After a short period on immunosuppression, high minimum inhibitory concentration values were obtained in the patients tested, all of whom remained in an active phase at this time. This rise in minimum inhibitory concentration became more marked with increasing length of immunosuppression. After more than 4 days treatment, no significant difference in minimum inhibitory concentration was apparent between the active and inactive groups. Immunosuppression appears to be the critical factor affecting the minimum inhibitory concentration. However, despite the fact that the test clearly differentiates between groups of patients receiving immunosuppression and those not so treated, this differentiation in itself is not sufficient to be of practical value in controlling immunosuppressive dosage in Crohn's disease. There was no consistent correlation with the degree of disease activity.

0801 NO EVIDENCE FOR DECREASED LYMPHOCYTE REACTIVITY IN CROHN'S DISEASE. *(E.)* Bird, A. G.; Britton, S. (Div. Immunobiol., Karolinska Inst., Stockholm, Sweden). *Gastroenterology* 67(5): 926-932, 1974.

The immunological status was investigated in a selected series of 20 patients (14 women and 6 men, average age 32.2 yr) with active Crohn's disease, ranging in duration from 3 months to 8 yr. Patients were not on corticosteroids for at least 2 months prior to the study. Two patients were on adrenocorticotrophic hormone; the majority were taking salicylazosulfapyridine. *In vitro* lymphocyte proliferative response of Crohn's disease patients to phytohemagglutinin and to purified protein derivative tuberculin did not differ significantly from that of 15 enteritis patients or from 15 healthy controls. Thus there is no evidence for a generalized reduction in T lymphocyte responsiveness in Crohn's disease. In studying the lymphocytes in the lymph nodes draining diseased bowel, mesenteric lymph nodes were removed at bowel resection on 6 patients. Again no evidence of impaired T-cell responsiveness could be found in these nodal lymphocytes as compared with the circulating lymphocyte activity in the same patients or to that of the control groups. The proportion of lymphocytes forming rosettes with sheep erythrocytes was similar to controls in the peripheral blood specimens studied. The mesenteric lymph node cell preparations also contained a high percentage of T-cells not different from control nodes. Mantoux reactivity was tested in 12 of the patients. Of the 12, 7 were nonreactive as compared with 2 of 14 enteritis controls. However, there was no correlation between Mantoux negativity and the *in vitro* lymphocyte reactivity to the antigens. It is possible that the disease process was interfering with the efferent limb of the skin hypersensitivity response, perhaps with the inflammatory component. Only 1 patient showed a markedly reduced *in vitro* lymphocyte responsiveness to both mitogens and antigens. She was Mantoux-negative and showed signs of severe malnutrition, supporting the concept of a link between malnutrition and reduced cell-mediated immunity. It is suggested that the case of phytohemagglutinin lymphocyte hyporesponsiveness described in Crohn's disease may be accounted for by prolonged malabsorption and malnutrition in some patients rather than to a uniform depression of T lymphocyte immunity.

0802 CHANGING PATTERNS IN EPIDEMIOLOGY OF CROHN'S DISEASE. *(E.)* Miller, D. S.; Keighley, A. C.; Langman, M. J. S. (Med. Sch., Nottingham Univ., England). *Lancet* 2(7882):691-693, 1974.

0803 GASTRIC ANTRAL NARROWING IN CHRONIC GRANULOMATOUS DISEASE OF CHILDHOOD. *(E.)* Griscom, N. T.; Kirkpatrick, Jr., J. A.; Girdany, B. R.; Berdon, W. E.; Grand, R. I.; Machie, G. G. (Harvard Med. Sch., Boston, Mass.). *Pediatrics* 54(4):458-460, 1974.

0804 INFLAMMATORY BOWEL DISEASE. THE SURGICAL PATHOLOGY OF CROHN'S DISEASE AND ULCERATIVE COLITIS. *(E.)* Price, A. B.; Path, M. R. C.; Morson, B. C.; Path, F. C. (St. Mark's Hosp., London, England). *Hum. Pathol.* 6(1):7-29, 1975.

See also, 0451, 0492.

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PRE-CLINICAL SCIENCES

MORPHOLOGY, CELLULAR STRUCTURE AND HISTOCHEMISTRY

0805 QUANTITATIVE HISTOLOGY OF THE GASTRIC MUCOSA: MAN, DOG, CAT, GUINEA PIG, AND FROG. *(E.)* Hogben, C. A. M.; Kent, T. H.; Woodward, P. A.; Sill, A. J. (Dep. Physiol. Biophys., Univ. Iowa, Iowa City). *Gastroenterology* 67(6):1143-1154, 1974.

A simpler method than those previously reported was applied to the quantitative histology of the gastric mucosae from man, dog, cat, guinea pig, and frog. Standardized strips of stomach wall, which varied according to the anatomy of the species, were selected for histological processing. After routine paraffin processing, sections were cut at 5 μ and stained in succession with 0.5% aldehyde fuchsin in 70% alcohol, with the usual steps for the periodic acid-Schiff technique, with Harris hematoxylin and with aurantia. One color 35-mm photomicrograph was taken from various sites in the corpus mucosa and magnified from 1000 to 1500. The various cell types were counted and from these values the percentage of each component calculated. Fourteen sites in man, 11 sites in dogs and cats, 8 sites in guinea pigs, and 3 sites in frogs were considered to be representative of the total corpus mucosa, and were averaged to determine the percentage that each component contributed to the mucosa of the gastric body. The corpus mucosal weight was calculated from the weight of the corpus and percentage of the wall that was mucosa. The mucosa of the gastric corpus as a fraction of the animal ranged from 1.1 g/kg for man to 4.3 for bullfrog, relative to body weight; or 12 g/m^2 for rat from a previous study to 62 for dog, relative to body surface area. The combined weight of mammalian parietal and chief cells was a fairly constant 53-58% of the corpus mucosa In the corpus mucosa of the guinea pig, there was a uniform distribution of parietal and chief cells. The parietal cell weight was 5 x the weight of the chief cells. In man, dog and cat, the parietal cell weight fraction increased toward the antrum, while that of chief cells decreased. Using data collected from the literature, "maximal" acid secretory rates were correlated with the total parietal cell weight and number of parietal cells. The maximal secretory rate expressed as mEq/hr/g of parietal cell varied among 5 mammals (man, dog, cat, guinea pig, and rat) by a factor of 5.3. Mean parietal cell volumes calculated from the weight of parietal cells divided by number of parietal cells ("parietal cell mass") are several times larger than mean volumes estimated from raw mean cell diameters. For interspecies comparison, expressing total parietal cell weight or maximal secretory rate relative to body surface area is not demonstrably better than normalizing these variables with respect to body weight.

0806 DIFFERENTIAL LOCALIZATION OF CELL SURFACE AND SECRETORY COMPONENTS IN RAT INTESTINAL EPITHELIUM BY USE OF LECTINS. *(E.)* Etzler, M. E.; Branstrator, M. L. (Dep. Biochem. Biophys., Univ. California, Davis). *J. Cell Biol.* 62(2):329-343, 1974.

Sections through various levels of small intestine from adult male Sprague-Dawley rats were examined by fluorescence microscopy after treatment with fluorescein isothiocyanate-labeled lectins from *Dolichos biflorus*, *Lotus tetragonolobus*, *Ricinus communis*, and *Triticum vulgare* (wheat germ). The animals were sacrificed by decapitation, and segments of the intestine removed next to the pylorus, and at 2-cm, 5-cm, 10-cm, 20-cm, and 25-cm distances from the pylorus. In some experiments, segments were also removed at the 50- and 75-cm levels, as well as 5-cm proximal to the cecum. The sections were mounted on slides and treated with approximately 100 μl of the appropriate fluorescein isothiocyanate-conjugated lectin at concentrations of 0.5-2 mg/ml. *L. tetragonolobus*, *R. communis*, and *T. vulgare* lectins reacted with the microvillar portion of the epithelial cells lining the crypts and villi in sections of intestine adjacent to the pylorus. This pattern of reactivity was sharply altered along the first 15 cm of intestine so that in sections distal to this point the luminal surfaces of only those epithelial cells in the crypts and at the base of the villi reacted with the *L. tetragonolobus* and *R. communis* lectins, whereas the wheat germ lectin reacted with the surfaces of the cells lining the villi. In sections from the distal end of the small intestine, all three lectins reacted with the surfaces of cells only at the base of the villi and in the crypts. The findings suggest that: 1) throughout most of the adult rat small intestine changes occur in the carbohydrate portion of the microvillar surface of the epithelial cells as these cells differentiate and move up the villi; 2) these changes in cell surface are related to the region of the intestine in which the villi are located; and 3) the carbohydrate nature of the secretory material of the goblet cells varies in different regions of the small intestine.

0807 STUDIES OF INTESTINAL ABSORPTION UNDER PATHOLOGICAL CONDITIONS. I. LIGHT MICROSCOPIC STUDIES OF INTESTINAL DAMAGE CAUSED BY SODIUM LAURYL SULFATE. *(E.)* Sugimura, F. (Nihon Univ. Sch. Med., Tokyo, Japan). *Nihon Univ. J. Med.* 16(1):25-37, 1974.

The effects of normal saline, 50% glucose, and 5% sodium lauryl sulfate (SLS) on the intestine were studied by light microscopy using *in vivo* preparations of unanesthetized adult male rabbit proximal jejunum. A 3 cm segment of small intestine was ligated on both ends and removed distal to a point 20 cm from the pylorus; these segments served as histological controls. The intestine was then ligated at a point 15 cm from the previous distal ligation, and either 10 ml of normal saline, 10 ml of 50% glucose solution, or 10 ml of 5% SLS solution was injected by syringe in this 15 cm segment of the intestine. After allowing the solution to remain in the loop of the intestine for 5, 10, 15, 30, and 60 min, a 3 cm segment was successively removed after each time period and examined microscopically. The epithelium was well preserved 60 min after instillation of normal saline and nearly physiologic. Except for marked eosinophilic changes with the 50% glucose solution, only mild increases in goblet cells and very mild desquamation of the epithelium were noted; the striated border remained intact. The SLS solution caused desquamation of the epithelium, disappearance of the striated border, and spreading lytic degenerative changes which started on the surface of the villi and then extended to the entire villi and to the muscularis propria. In the area of focal degeneration, disappearance of the epithelial cells, indistinctiveness of the cell borders, prominent nuclei, and localized necrotic changes were noted. It is concluded that SLS has a toxic effect on the intestine. The initially focal and then spreading lytic changes of the villi and the muscularis propria appear to be due to permeation of the surface-active agent and demonstration of the proteins by SLS. Disappearance of the striated borders and obscuring of the cell borders and the nuclei are probably due to dissolution of biological membranes by SLS.

0808 STUDIES OF INTESTINAL ABSORPTION UNDER PATHOLOGICAL CONDITIONS. II. ELECTRON MICROSCOPIC STUDIES OF INTESTINAL DAMAGE CAUSED BY SODIUM LAURYL SULFATE.

(E.) Sugimura, F. (Nihon Univ. Sch. Med., Tokyo, Japan). *Nihon Univ. J. Med.* 16(1):39-50, 1974.

In vivo effects of 5% sodium lauryl sulfate (SLS) on the intestinal epithelium in unanesthetized adult male rabbits were studied by electron microscopy. A 3 cm segment of jejunum was excised beginning from a point 20 cm from the pylorus to serve as a control. The intestine was then ligated at a point 15 cm from the previous ligation and into this 15 cm segment of jejunal tube 10 ml of 5% SLS was injected. After 5, 10, 15, 30, and 60 min, 3 cm segments of the intestine were successively ligated and excised, and examined by scanning electron microscopy or electron microscopy. Sixty min after the instillation of 5% SLS, a scanning electron microscopic view showed a marked reduction in the height of small intestinal villi, poorly defined individual villus, and what appeared to be a viscous substance covering the surface of the villi. It is suggested that this substance is a mixture or a conjugate of SLS with degenerated fuzzy coat, degenerated substance from the damaged portion of the intestine, and the secretions from the intestinal glandular cells. Under electron microscopy, the microvilli showed an altered arrangement, decreased height, and aggregation or disappearance after instillation of SLS. The formation of a terminal web was indistinct. The mitochondria and the majority of the lysosomes showed degeneration or disappearance. Some endoplasmic reticula showed saccular dilatation of the inner lumen, and the Golgi apparatus showed marked dilatation of Golgi vesicles. The intercellular spaces were widened and accumulation of absorbed substances was seen. Alterations in the ultramicroscopic structures of absorptive cells were more marked in those organelles which are involved in protein metabolism, leading to the conclusion that the tissue-damaging effect of SLS is basically due to its protein denaturing properties. These findings suggest that SLS causes an abnormality in intestinal absorption and is suitable to produce a pathologic intestinal model for the study of intestinal absorption in a pathological state.

0809 THE BURSA OF FABRICIUS: A CENTRAL ORGAN PROVIDING FOR CONTACT BETWEEN THE LYMPHOID SYSTEM AND INTESTINAL CONTENT.

(E.) Schaffner, T.; Mueller, J.; Hess, M. W.; Cottier, H.; Sordat, B.; Ropke, C. (Dep. Pathol., Univ. Bern, Switzerland). *Cell Immunol.* 13(2):304-312, 1974.

The functions of the avian bursa of Fabricius were examined in male White Leghorn chickens. Fifteen chickens were fed 1.0 ml of colloidal carbon 3 times/day for 1 week and were sacrificed 10 days after the last feeding. Only the bursal tufts and follicles contained carbon particles. There was no appreciable carbon deposition in the epithelium outside the tufts or in the cortical zone. Colloidal carbon (0.1 ml) was administered *via* cloacal irritation to a total of 30 birds and groups of 5 animals sacrificed at various intervals from 15 min to 16 hr later. Within 15 min after carbon administration by this route, particles were present in the epithelial tufts; at 2 hr, they appeared in subepithelial locations; and at 16 hr, carbon aggregates were observed throughout the medullary portion of bursal follicles. The uptake of particles of different quality and size was studied following topical administration of 0.1 ml of colloidal thorium dioxide (thorotrast) or of a suspension containing latex spheres of different sizes. Twenty-four hr after administration, latex particles from 0.09 to at least 1.1 μm diameter and thorotrast particles also entered the bursal tissue, and were seen in the epithelial tufts, in macrophages and/or between lymphoid cells of the follicles. Bacteria (*Escherichia coli* or *Staphylococcus albus*) were administered in a suspension (0.1 ml) containing 5 x 10^9 microorganisms/ml directly into the bursal duct. No entry of living bacteria into the lymphoid tissue was observed by light or electron microscopy. The epithelial tuft cells which transported the inert particles administered in these studies are distinctively equipped with lytic enzymes. Based on these findings, it seems reasonable to assume that particulate material of microbial origin, would, upon penetration, be degraded rapidly and efficiently by cells of the epithelial tufts. Such a protective mechanism may yield antigenic fragments having an immunogenic role in the bursa or elsewhere.

0810 RECOVERY OF FUNCTION AND STRUCTURE OF DOG ILEUM AND COLON FOLLOWING TWO HOURS' ACUTE ISCHAEMIA.

(E.) Robinson, J. W. L.; Haroud, M.; Winistorfer, B.; Mirkovitch, V. (Cantonal Univ. Hosp., Lausanne, Switzerland). *Eur. J. Clin. Invest.* 4(6): 443-452, 1974.

Loops of mongrel dog small intestine and colon were subjected to 2 hr acute ischemia under pentobarbital anesthesia (30 mg/kg) and their recovery studied simultaneously by functional and histological examination. The dogs were reoperated 1, 3, or 7 days after the 2-hr total ischemia for excision and examination of the treated loops and an adjacent control. Immediately after the ischemia, both organs showed serious necrotic lesions of the mucosal surface, their active transport capacities were abolished, mucosal Na$^+$-K$^+$-ATPase activities were reduced, and a significant liberation of acid phosphatase into the efferent blood was observed. The lesions of the ileal loops were more severe than those of the colonic loops. The ileal loops had a finite, but greatly reduced function 24 hr after the trauma. After 3 days, amino-acid transport had normalized but sugar transport was still reduced. Histological examination showed that epithelial cells covered the villi of most samples after 24 hr, and that normalization was almost complete after 3 days. All parameters were normal after 1 week. In 5 of 8 loops, the colonic mucosa was replaced by a compact polymorphonuclear infiltration bathing in a hemorrhagic exudate 24 hr after the ischemic period; it was evidently quite functionless. In 3 loops the mucosa was preserved, but only 1 had functional activity. Three days after the trauma, functional activity was finite, but lower than that of the control loops; histological examination revealed a disorganized mucosa, often with ulcers surrounded by relatively healthy tissue. At 7 days, the mean transport capacity was normal but there were still pathological signs at the microscopic level. The findings indicate that the ileum is more sensitive to ischemic damage, but has a greater regenerative potential than the colon. There was a good correlation between the functional and structural state of the tissues.

0811 ULTRASTRUCTURAL EFFECTS OF DIETARY GALACTOFLAVIN ON MOUSE HEPATOCYTES. *(E.)* Tandler, B.; Hoppel, C. L. (Sch. Med., Case Western Reserve Univ., Cleveland, Ohio). *Exp. Mol. Pathol.* 21(1):88-101, 1974.

The ultrastructural effects of a galactoflavin-supplemented (60 mg/kg of diet), riboflavin-free diet were chronologically examined in mouse hepatocytes to compare the effects of this drug with those produced by simple riboflavin deficiency. Control animals were maintained on a complete diet containing riboflavin and lacking galactoflavin. Animals were sacrificed by decapitation every 1-3 days from day 3-22, and on day 28 after initiation of the experimental diet. Some animals with signs of severe deficiency at day 20 or 21 were placed on a normal diet and given a daily i.p. injection of 0.35 mg riboflavin. Recovering animals were sacrificed daily until day 5, 7 and on day 10 after beginning the normal dietary program. Liver specimens were studied by electron and light microscopy. In animals on the experimental diet, the mitochondrial population suffered the greatest changes. Beginning with day 3, the mitochondria first became elongated, then later rounded up to become somewhat enlarged spheres. By day 20-22 the mitochondria reached diameters of about 6 μm, and had cristae that were largely confined to the periphery of the organelles. Throughout the course of enlargement, spontaneously partitioned mitochondria of all sizes were common. When the mice with advanced ariboflavinosis were injected with riboflavin, mitochondrial recovery took place over a period of more than 10 days. Division of the enlarged mitochondria proceeded by medial attenuation, rather than by partition formation and constriction. The mechanism that selects which of the two modalities of mitochondrial replication will prevail remains undetermined.

0812 MESENCHYME SPECIFICITY IN RODENT SALIVARY GLAND DEVELOPMENT: THE RESPONSE OF SALIVARY EPITHELIUM TO LUNG MESENCHYME IN VITRO. *(E.)* Lawson, K. A. (Hubrecht Lab., Utrecht, Netherlands). *J. Embryol. Exp. Morphol.* 32(2):469-493, 1974.

0813 PROXIMAL LIMITS OF THE GASTRIC ANTRUM. *(It.)* Brizzi, E.,; Serantoni, C.; Ciani, P. A.; Marinelli, R.; Fulignati, A. (Dep. Topogr. Anat., Univ. Florence, Italy). *Chir. Gastroenterol.* 8(2):137-152, 1974.

0814 THE GASTROEPIPLOIC NERVE IN MAN. *(It.)* Brizzi, E.; Serantoni, C.; Ciani, P. A.; Fulignati, A.; Marinelli, R. (Dep. Topogr. Anat., Univ. Florence, Italy). *Chir. Gastroenterol.* 8(1): 3-16, 1974.

0815 THE ANATOMY OF THE SUPERIOR MESENTERIC PLEXUS AND NERVES OF THE SMALL INTESTINE IN MAN. *(Rus.)* Sharov, V. A. (Med. Stomatol. Inst., Moscow, USSR). *Arkh. Anat. Gistol. Embriol.* 67(9): 106-110, 1974.

0816 THE PERMEABILITY PATHWAYS IN THE WALLS OF INTESTINAL SUBMUCOSAL ARTERIOLES IN ACUTE ANGIOTENSIN-INDUCED HYPERTENSION IN RATS. *(E.)* Thorball, N.; Olsen, F. (Dep. Anat. C, Univ. Copenhagen, Denmark). *Acta Pathol. Microbiol. Scand* [*A*] 82(6):683-689, 1974.

0817 FINDING OF GANGLION CELLS IN THE MUCOSA OF THE COLON, SIGMOID, AND RECTUM. *(Ger.)* Lassmann, G. (Neurol. Inst., Univ. Vienna, Austria). *Virchows Arch.* [*Pathol. Anat.*] 365(3):257-261, 1975.

0818 FUNCTIONAL MORPHOLOGY OF THE PANCREAS ASSOCIATED WITH VARIOUS DIETS. *(Rus.)* Permiakov, N. K.; Titova, G. P.; Podolskii, A. E. (N. V. Sklifosovskii Res. Inst. Emerg. Med. Treat., Moscow, USSR). *Arkh. Patol.* 36(10):25-33, 1974.

0819 INVESTIGATION OF LOCALIZATION OF MONOAMINE OXIDASE (EC 1.4.3.4.) IN SUBFRACTION OF RAT LIVER MITOCHONDRIA. *(E.)* Turska, E.; Turski, W. (Inst. Physiol. Biochem., Med. Acad., Lodz, Poland). *Enzyme* 19(4):140-148, 1975.

MORPHOLOGY, CELLULAR STRUCTURE AND HISTOCHEMISTRY

0820 BIOSYNTHESIS OF SERUM ALBUMIN IN RAT LIVER. ISOLATION AND PROBABLE STRUCTURE OF 'PRO-ALBUMIN' FROM RAT LIVER. *(E.)* Quinn, P. S.; Gamble, M.; Judah, J. D. (Univ. Coll. Hosp. Med. Sch., London, England). *Biochem. J.* 146(2):389-393, 1975.

See also, 0840, 0880, 0926, 0939, 0940, 0963, 1015, 1060, 1061, 1063, 1064, 1080, 1083, 1084, 1094, 1129, 1527.

ABSORPTION—EXCRETION—TRANSPORT

0821 EFFECT OF FORCE-FEEDING A VALINE-FREE DIET ON GASTROINTESTINAL FUNCTION OF RATS. *(E.)* Kimura, T.; Suzuki, S.; Yoshida, A. (Dep. Agric. Chem., Nagoya Univ., Japan). *J. Nutr.* 105(2):257-265, 1974.

The effect of an essential amino acid deficiency on gastrointestinal functions was studied by force-feeding male Wistar rats a 10% amino acid diet devoid of valine for several days, and then giving them a complete amino acid diet. The diets were force-fed 3 times daily at 4-hr intervals in amounts of 3.5, 3, and 3.5 g. Force-feeding of the valine-free diet for 4 or 11 days delayed the disappearance of dietary nitrogen and trichloroacetic acid (TCA)-soluble nitrogen from the gastrointestinal tract. A single feeding of the complete amino acid diet containing ^{14}C-labeled amino acids or [^{14}C]glucose to rats previously fed the valine-free diet, did not improve disappearance of the nitrogen. The absorption of dietary carbohydrate (4.25 µCi of [U-^{14}C]glucose) as well as the dietary nitrogen was delayed after feeding the valine-free diet, but the delayed absorption of the dietary nitrogen was improved after 1 day of feeding the complete amino acid diet to rats previously fed the valine-free diet. In spite of the delayed disappearance of dietary ^{14}C-labeled amino acids or [^{14}C]-glucose from the gastrointestinal tract, the incorporation of these dietary ^{14}C-labeled amino acids into liver lipids was not different in rats fed the complete amino acid diet and in those fed the valine-free diet. It is concluded that changes in disaccharidase activities in the intestinal mucosa were in parallel with changes in the disappearance of nutrients from the gastrointestinal tract under the experimental conditions used.

0822 A MODEL FOR PASSIVE TRANSPORT OF POTASSIUM BY THE STOMACH: EVIDENCE FROM IN VITRO STUDIES. *(E.)* Makhlouf, G. M. (Med. Coll. Virginia, Richmond). *Am. J. Physiol.* 227(6):1285-1288, 1974.

The mechanism of K^+ secretion by the stomach was studied in frog mucosal sacs bathed on the serosal side only with buffered Ringer solution containing 1-4 mM K^+. Microsamples of secretion were obtained and analyzed for H^+, Na^+, and K^+ by flame photometry. The potential difference was measured continuously with K^+-free saline (0.1 M NaCl) agar bridges. Secretory K^+ concentration was linearly related to serosal K^+ concentration. Concentrations ranged from 3.5 mM at 1 mM serosal K^+ to 11.9 mM at 4 mM serosal K^+. The slope of the relation indicated that K^+ was concentrated 3-fold in secretion. The initial potential difference (39.7 mV) fell with the start of secretion. The extent of the fall corresponded to the expected liquid junction potential (E_j) between the acid contents and the saline agar bridge. The potential difference during secretion, corrected for E_j, was similar to the initial presecretory potential difference (38.5) and somewhat higher than the mean K^+ equilibrium potential. Given the high K^+ permeability of the mucosa, the electrical gradient was of sufficient magnitude to determine a 3-fold concentration gradient in the water of secretion. The latter represented the common but independent link of H^+ and K^+ secretion, thus providing a ready explanation for the correlation of H^+ and K^+ flux rates and of H^+ and K^+ concentrations. It was not determined whether the pathway for the movement of K^+ into the lumen was intercellular or transcellular *via* a labile intracellular compartment. Either pathway would allow K^+ to be distributed at or close to electrochemical equilibrium in a fluid osmotically determined by the active transport of H^+ and Cl^-.

0823 ALTERATION OF THE PHYSICAL PATHWAYS THROUGH THE GASTRIC MUCOSA BY SODIUM TAUROCHOLATE. *(E.)* Birkett, D.; Silen, W. (Harvard Med. Sch., Boston, Mass.). *Gastroenterology* 67(6):1131-1138, 1974.

The effect of sodium taurocholate on gastric mucosal permeability was investigated using an *in vitro* preparation of rabbit fundic gastric mucosa mounted in an Ussing chamber and perfused with a physiological solution at 37 C. The permeability was measured by the mucosal to serosal flux of the water-soluble, nonlipid soluble, nonelectrolyte, [^{14}C]erythritol, [^{14}C]-mannitol, and [^{14}C]lactose. The transmucosal flux measurements were made during the 2nd and 3rd hr after mounting in the Ussing chamber by adding 5 µCi of the nonelectrolyte to the mucosal solution and taking 1000 µl samples from the serosal solution for scintillation counting at 15-min intervals. The flux rate of erythritol in normal tissue was 1.85 pM/cm^2/sec and was increased by 20 mM sodium taurocholate in the mucosal solution at pH 7.0 and pH 3.0 to 5.46, and 25.48 pM/cm^2/sec, resp. after 1 hr, demonstrating a pH-dependent effect. At pH 3.0, sodium taurocholate in the mucosal solution at doses of 2.5, 5, and 10 mM increased the mucosal to serosal flux rate to 3.98, 5.81, and 13.52 pM/cm^2/sec, resp., after 1 hr, demonstrating a dose-related effect. There was no statistical difference between the mucosal to serosal flux of erythritol with 20 mM sodium taurocholate in the mucosal or serosal solutions. The fluxes of mannitol and lactose were altered in a similar direction by sodium taurocholate, but the absolute flux of these substances was less than that of erythritol because of the larger size of the molecule. It is suggested that sodium taurocholate causes an increase in permeability of the gastric mucosa through water-filled channels, which may be responsible for the increased transmucosal flux of H^+ and Na^+ caused by bile salts.

0824 EFFECT OF SEVERE ANOXIA ON THE PERMEABILITY OF GASTRIC MUCOSA. *(E.)* Birkett, D.; Silen, W. (Harvard Med. Sch., Boston, Mass.). *Proc. Soc. Exp. Biol. Med.* 148(1):256-260, 1975.

The effect of severe anoxia on the H^+ back diffusion and the permeability of the gastric mucosa to erythritol was investigated *in vitro*, using gastric mucosa from male New Zealand white rabbits. Each side of the mucosa was perfused separately with Ringer's solution containing 136 mM NaCl, 5 mM KCl, 3.5 mM $CaCl_2 \cdot 2H_2O$, and 1.2 mM $MgCl_2 \cdot 6H_2O$, and aerated with either 100% O_2 for the control or 100% N_2 to produce severe anoxia. The mucosal and serosal jackets were maintained independently at pH 7.4. The H^+ concentration of the mucosal solution was altered, and the back diffusion determined from the amount of 0.05 N HCl needed to maintain constant pH. To determine erythritol flux, tissues were perfused with phosphate-buffered Ringer's solution (pH 7.0) containing 1 mM erythritol to which increments of ^{14}C erythritol were added. The H^+ back diffusion rate increased as the pH fell in the oxygenated tissues. The rate was greater in the unoxygenated tissues but to a significant degree only after 1.5 hr. Erythritol flux rate from mucosal to serosal solution rose after 45 min of anoxia but not to a statistically significant degree. The 100% N_2 caused an immediate fall to zero of the electric potential, while the controls showed a slow, gradual decline. It is concluded that anoxia increases mucosal permeability only when prolonged to an extent beyond that likely to be found *in vivo*.

0825 INFLUENCE OF POTASSIUM CHLORIDE ON ALCOHOL ABSORPTION. *(E.)* Redetzki, H. M.; Dees, W. L.; Maddox, J. H. (Louisiana State Univ. Sch. Med., Shreveport). *Life Sci.* 15(6):2145-2156, 1974.

The effects of potassium chloride on alcohol absorption was investigated in female Sprague-Dawley rats. Alcohol was administered either through a stomach tube intragastrically (4 g/kg) or i.v. (2 g/kg). Potassium chloride was added to the intragastrically administered alcohol solutions in quantities to provide dosages of 215 mg/kg, 430 mg/kg and 860 mg/kg. Plasma potassium levels were determined by flame photometry. Simultaneous intragastric administration of the 2 larger doses of KCl with ethanol significantly reduced blood alcohol levels and diminished manifestations of alcohol intoxication. It was shown with parenteral administration of alcohol that the effect was not related to an acceleration of alcohol metabolism. Equimolal concentrations of NaCl were unable to duplicate these effects, thus indicating that they are specific actions of the potassium ion. Analysis of alcohol concentrations of gastric and intestinal content as well as *in situ* studies with animals whose stomachs were ligated at the pylorus revealed that KCl interferes with the absorption of alcohol through inhibition of gastric absorption and gastric emptying.

0826 INFLUENCE OF GLUCAGON ON THE HUMAN JEJUNUM. *(E.)* Hicks, T.; Turnberg, L. A. (Manchester R. Infirm., England). *Gastroenterology* 67(6):1114-1118, 1974.

Jejunal net transport of salt and water was measured using a triple lumen tube perfusion technique in a group of 22 normal adult volunteers ranging in age from 18 to 34 yr. Commercially available porcine pancreatic glucagon given by infusion for 90 min reduced the absorption of Na^+, Cl^-, and water. A dose-response curve for glucagon indicated that the effect on ion transport was maximal to 0.6 µg/kg/hr, and this effect decreased as the dose was increased, until, at a dose of 2.7 µg/kg/hr, ion transport was unaffected. The mean transit time was increased by glucagon in a dose of 1.2 µg/kg/hr, and the calculated volume and diameter of the jejunum was also increased. The levels of plasma concentration calculated to have been achieved by these infusions were above those reported under physiological conditions, but they were within the range which could conceivably be found in pathological conditions where these observations may have some relevance.

0827 JEJUNAL PERFUSION OF SIMPLE AND CONJUGATED FOLATES IN MAN. *(E.)* Halsted, C. H.; Baugh, C. M.; Butterworth, Jr., C. E. (Johns Hopkins Univ. Sch. Med., Baltimore, Md.). *Gastroenterology* 68(2):261-269, 1975.

The assimilation of pteroylpolyglutamate was studied in 5 healthy adult volunteers using the jejunal perfusion technique. Two µM each of ^3H-labeled pteroylpolyglutamate and synthetic ^{14}C-labeled pteroylheptaglutamate/liter of isotonic saline were perfused and aspirated by multilumen tubes. Polyethylene glycol was also added as a non-absorbable marker. A turbidometric method was used to determine polyethylene glycol concentration, counting was done by liquid scintillation counter, and intestinal aspirates were also subjected to analytical ion exchange column chromatography. The folates were also exposed to intestinal juice *in vitro* under similar physical conditions as in the *in vivo* studies. In each subject the concentrations of both types of folate decreased progressively with intestinal passage: a rate of 14.94 and 10.51 nM/min for the ^3H- and ^{14}C-folates, resp. In the unabsorbed fraction, 16.6% remained as ^{14}C-pteroylheptaglutamate, while 30.8% was in the form of its hydrolytic derivatives. In contrast, 84-95% of the ^{14}C was in the form of the parent compound *in vitro*. It is concluded that contact of conjugated folate with the intestinal mucosa is required for its digestion, and that progressive hydrolysis of pteroylheptaglutamate may be an integral part of its absorptive mechanism.

0828 THEOPHYLLINE, CYCLIC AMP, CHOLERAGEN, AND ELECTROLYTE TRANSPORT BY RABBIT ILEUM. *(E.)* Powell, D. W.; Farris, R. K.; Carbonetto, S. T. (Univ. North Carolina Sch. Med., Chapel Hill). *Am. J. Physiol.* 227(6):1428-1435, 1974.

The effects of theophylline, cyclic AMP (cAMP), and purified cholera toxin (choleragen) on electrolyte transport were studied in the *in vitro* rabbit ileum in Ringer solution. Theophylline (10 mM) and cAMP (7.5 mM) were added to the serosal bathing solution along with equimolar mannitol in the mucosal solution to balance the osmolality. Choleragen in concentrations of 2 μg/ml was added to the mucosal solution after mounting intestine in 10 mM mannitol-Ringer. Tissues were continuously short-circuited except for brief periods when the open-circuit potential difference was determined. Radioactive isotope (^{22}Na, ^{24}Na, ^{36}Cl) was added to the mucosal and/or serosal bath 10-15 min after mounting. Seven 20-min flux periods were measured beginning 15 min after the isotope was added in the theophylline and cAMP experiments; 4 15-min fluxes, beginning at 175 min, were measured in the choleragen studies. The effects of all 3 agents were basically the same. All 3 caused a short-lived stimulation of short-circuit current, a sustained increase in potential difference, a reduction in electrical conductance, and a secretion of Na^+ as well as Cl^-. The Na^+ and Cl^- secretion was inhibited by ouabain. Theophylline caused Cl^- secretion in HCO_3^--free solution and probably HCO_3^- secretion in Cl^--free solution. Theophylline had no effect on Na^+ transport in the absence of Cl^- and HCO_3^- and no effect on anion transport in the absence of Na^+. These effects are similar to those previously demonstrated with cholera toxin. This investigation lends support to the concept that cAMP is involved in the electrolyte secretion of cholera and suggests that increased cellular cAMP levels stimulate the neutral secretion of NaCl and/or $NaHCO_3$.

0829 INTESTINAL ABSORPTION OF SOME HETEROCYCLIC AND AROMATIC AMINO ACIDS FROM THE AGEING GUT. *(E.)*

Penzes, L.; Boross, M. (Univ. Med., Budapest, Hungary). *Exp. Gerontol.* 9(5/6):253-258, 1974.

The influence of age on intestinal absorption of L-tryptophan, L-phenylalanine and L-proline was studied in 6-, 12-, and 27-month old female Wistar rats. The amino acids were applied in the following initial concentrations: tryptophan, 1, 2, 5, and 10 mM; phenylalanine, 5, 10, 20, and 30 mM; and proline, 10, 20, 40, and 80 mM. Absorption rates were calculated using the Lineweaver-Burk relationship to establish the Michaelis constants (K_m and V_{max}) for each amino acid. The young animals had the smallest numerical K_m values in each case: typtophan, 1.4, 6.8, and 3.1 for young, adult, and old rats, resp.; phenylalanine, 10.6, 17.7, and 42.4 mM, resp.; and proline, 23.3, 28.0, and 36.6 mM, resp. The maximal transport velocities (V_{max}), given in M/g dried intestine/20', were as follows: tryptophan, 75.7, 153.1, and 85.0 for young, adult, and old rats, resp.; phenylalanine, 221.1, 448.4, and 724.6, resp.; and proline 409.5, 445.2, and 879.5, resp. The observed K_m values indicate that these diminish with increasing lipophilic characteristics of the amino acid. The V_{max} was in inverse ratio to lipid solubility. This indicates that a high numerical value for K_M corresponds to a considerable value of V_{max}, which results, in general, in an intense rate of absorption. It is concluded that a high numerical value for K_m corresponds to a considerable value of V_{max}, which results, in general, in an intense rate of absorption. It is concluded age-dependent phenomenon.

0830 EFFECT OF PHENOBARBITAL ON INTESTINAL CHOLIC ACID ABSORPTION IN THE RAT. *(E.)*

Ostrower, V. S.; Coan, P.; Kern, Jr., F. (Univ. Colorado Med. Cent., Denver). *Gastroenterology* 67(6):1162-1168, 1974.

Kinetic data on the passive jejunal and active ileal transport of cholic acid were determined in control and phenobarbital-treated female Sprague-Dawley rats using an *in vivo* isolated loop perfusion technique. The treated rats received s.c. sodium phenobarbital, 80 mg/kg/day for 8 days. Perfusion solutions for individual experiments were labeled with [^{14}C]cholic acid, brought to final volume with Krebs-bicarbonate, and to a final pH of 8; final concentrations varied between 0.1 and 10 mM. Perfusions were carried out at a calibrated rate of 0.52 ml/min for 60-120 min. During perfusions, consecutive 5-min aliquots of bile were collected directly into counting vials and the radioactivity in bile and perfusion solutions counted in a liquid scintillation spectrometer. Transport in the jejunum was consistent with a passive transport mechanism. The passive diffusion coefficient for jejunal transport for control animals (136 pM/min/cm/100 g/mM) was not significantly different than that for treated animals (147 pM/min/cm/100 g/mM). The maximum absorption rate for active ileal transport in phenobarbital-treated rats (5300 pM/min/cm/100 g) was twice that for control animals (2239 pM/min/cm/100 g). This suggests that the active bile salt ileal transport mechanism can be enhanced by phenobarbital. This effect may play a role in phenobarbital-induced alterations of the enterohepatic circulation of bile salts and may be of benefit in some bile salt malabsorption syndromes.

0831 UPTAKE OF CALCIUM BY MICROVILLOUS MEMBRANES OF INTESTINAL EPITHELIAL CELLS. *(E.)*

Hudson, D. A. (Dunn Nutr. Lab., Univ. Cambridge, England) *Life Sci.* 16(1):117-129, 1975.

Some of the characteristics of uptake of Ca^{++} by microvillous membranes from the small intestine of male and female Dutch rabbits were investigated in the absence and presence of ATP. Uptake of Ca^{++} was measured by a Millipore filtration technique. The membranes (100 μg of protein) were incubated at 37 C for 20 min in a medium containing 10 mM Tris Hepes (pH 7.4), 0.2 μCi ^{45}Ca, and $CaCl_2$ to the desired final concentration. In the absence of ATP, Ca^{++} uptake was independent of temperature (3-37 C), reduced by the presence of other cations, and dependent upon pH and the number and type of "binding" sites. At all Ca^{++} concentrations tested up to 5×10^{-3} M, addition of ATP (0.1-10 mM) at 37 C caused a reduction in uptake relative to controls. Mg^{++} (2 mM) caused a partial reversal of this ATP-induced reduction. Between 5 and 10 mM Ca^{++}, addition of ATP increased the amounts of the ion apparently associated with the membranes. The type, extent, and stability of the association of Ca^{++} with microvillous membranes is probably determined by the number and type of dissociable anions capable of complex formation. Two non-specific factors may have contributed to the observed relationship between Ca^{++} concentration and its uptake in the presence of ATP: 1) the chelating properties of the nucleotide and its breakdown products; and 2) an increase in the ionic strength of the incubation medium. It is suggested that stimulation of

a^{++} uptake by ATP when the ion was present at concen-
rations of 5 mM and higher may be explained without
nvoking any causal relation between nucleotide hydro-
ysis and ion movement.

832 THE SITE OF ZINC ABSORPTION IN THE RAT SMALL INTESTINE. *(E.)* Emes, J. H.;
rthur, D. (Dep. Nutr., Univ. Guelph, Canada). *Proc.
oc. Exp. Biol. Med.* 148(1):86-88, 1975.

he site of zinc absorption was determined by compar-
ng the zinc distribution patterns in the small in-
estine of zinc-deficient rats with controls, and by
easuring ^{65}Zn absorption. To study distribution,
he small intestines were cut into 5 equal segments,
et-ashed, and measured for zinc content by atomic
bsorption spectrometry. ^{65}Zn absorption was mea-
ured by gamma well detector after incubation of in-
estine with $^{65}ZnCl_2$. Zinc distribution was highest
n the 5th segment and lowest in the 2nd in controls,
hile deficient rats showed a constant small but sig-
ificant increase from the 2nd segment to the distal
leum, though total zinc concentration was reduced.
^{5}Zn absorption showed a steady increase from duodenum
o distal ileum on a per weight basis, while on a per
nit length basis showed a bimodal pattern of uptake.
t is suggested zinc absorption occurs most actively
n the distal ileum.

0833 THE TRANSMISSION OF ^{125}I-LABELED IMMUNOGLOBULIN G BY PROXIMAL AND DISTAL REGIONS
F THE SMALL INTESTINE OF 16-DAY-OLD RATS. *(E.)*
orris, B. (Dep. Zool., Univ. Nottingham, England).
. Physiol. (Lond.) 245(1):249-259, 1975.

abeled immunoglobulin transmission from the small
ntestine of 16 day Wistar rats was studied to deter-
ine the region most important in its absorption.
istological studies were also done to determine the
xtent of distal intestine lined by epithelial cells
ith large supranuclear vacuoles. Rat IgG was labeled
ith ^{125}I and 2 ml injected into the proximal or the
istal small intestine by incision through the body
all. The intestine was ligated proximal to the injec-
ion site. Blood was collected from the heart, and as-
ayed for radioactivity, the protein content removed by
entrifugation, and the radioactivity determined for
oth precipitate and supernatant. Values were ex-
ressed as concentration quotients (cpm/0.1 ml serum
rotein to cpm/0.1 ml of injected preparation). Sec-
ions of intestinal wall were fixed in Bouin's fluid
and stained in either Ehrlich's hematoxylin and eosin,
or Harris's hematoxylin and alcian blue. The concen-
ration quotients from 2 and 3 hr after injection
into the proximal intestine were high (0.0130-
.1031) while those from an equal time after injec-
ion into the distal portion were very low (0.00062-
.0096). The histological studies demonstrated that
the extent of the terminal gut region increased with
age and was characterized by the new type epithelial
cells with large supranuclear vacuoles. It is con-
cluded that a greater amount of IgG absorption occurs
in the proximal intestine due to cell type changes in
the distal regions.

0834 COMPARISON OF TRANSPORT MECHANISMS IN ISOLATED ASCENDING AND DESCENDING RAT COLON. *(E.)* Yau, W. M.; Makhlouf, G. M. (Med. Coll. Virginia, Richmond). *Am. J. Physiol.* 228(1):191-195, 1975.

The transport properties of the ascending and descending colon of 19 unfasted male albino rats were compared *in vitro*. The mucosal tubes were everted and cut into equal proximal and distal halves. Each half was ligated at one end and tied to a cannula at the other. They were filled with and immersed in a bathing solution containing (in mM/liter) 145.6 Na$^+$, 5.3 K$^+$, 1.3 Ca^{++}, 1 Mg^{++}, 125.7 Cl$^-$, 24.2 HCO$_3^-$, 2 H$_2$PO$_4$, and 15 glucose (298.7 mOsm/kg). Water flux was measured gravimetrically and used to calculate net ionic flux. Potential differences were measured with agar bridges in the mucosal and serosal compartments. Na$^+$ and K$^+$ were measured by flame photometer. The net volume, anion, and total solute fluxes were similar in both colon segments, but their ionic components were not. The descending colon absorbed significantly less Na$^+$ and more HCO$_3^-$, as well as significant amounts of K$^+$. The ascending colon neither absorbed nor secreted K$^+$. In the serosal compartment, Na$^+$ and Cl$^-$ concentrations increased, and HCO$_3^-$ decreased, to different extents in the 2 segments. Most pronounced was the difference in the K$^+$ concentration, which decreased by about 26% in the ascending segment, but increased by about 36% in the descending segment. No consistent differences between the 2 segment types were found in the electrical gradient. In both, Na$^+$ absorption occurred against electrical and chemical gradients. It is concluded that a quantitative difference in Na$^+$ absorption, HCO$_3^-$ secretion, and a qualitative difference in K$^+$ transport exists between the ascending and descending colon.

0835 NON-PARALLEL TRANSPORT OF MEMBRANE PROTEINS AND CONTENT PROTEINS DURING ASSEMBLY OF THE SECRETORY GRANULE IN RAT PAROTID GLAND. *(E.)* Wallach, D.; Kirshner, N.; Schramm, M. (Dep. Biol. Chem., Heb. Univ. Jerusalem, Israel). *Biochim. Biophys. Acta.* 375(1):87-105, 1974.

0836 TRANSPORT AND ELECTRICAL PHENOMENA IN RESTING AND SECRETING PIGLET GASTRIC MUCOSA. *(E.)* Forte, J. G.; Machen, T. E. (Inst. Anim. Physiol., Cambridge, England). *J. Physiol. (Lond.)* 244 (1):33-51, 1975.

0837 DISPOSITION OF N,N-BIS(PHENYLCARBAMOYLMETHYL)DIMETHYL AMMONIUM CHLORIDE IN THE RAT: AN INTERESTING EXAMPLE OF FIRST-PASS METABOLISM. *(E.)* Gibaldi, M.; Axelson, J. E.; Conway, W. D. (Sch. Pharm., State Univ. New York Buffalo). *J. Pharm. Sci.* 64(2):359-360, 1975.

0838 EFFECT OF ETHANOL ON THEOPHYLLINE ABSORPTION IN HUMANS. *(E.)* Koysooko, R.; Ellis, E. F.; Levy, G. (Sch. Pharm., State Univ. New York Buffalo). *J. Pharm. Sci.* 64(2):299-301, 1975.

0839 INTESTINAL CONDUCTANCE AND PERMSELECTIVITY CHANGES WITH THEOPHYLLINE AND CHOLERAGEN. *(E.)* Powell, D. W. (Univ. North Carolina Sch. Med., Chapel Hill). *Am. J. Physiol.* 227(6):1436-1442, 1974.

0840 THE EFFECT OF PREGNANCY AND LACTATION ON FOOD INTAKE, GASTROINTESTINAL ANATOMY AND THE ABSORPTIVE CAPACITY OF THE SMALL INTESTINE IN THE ALBINO RAT. *(E.)* Cripps, A. W.; Williams, V. J. (Dep. Physiol., Univ. New England, Armidale, Australia). *Br. J. Nutr.* 33(1):17-32, 1975.

0841 INFLUENCE OF THE STATE OF DIETARY PROTEIN ON THE RATE OF AMINO ACID DIGESTION AND ABSORPTION IN THE SMALL INTESTINE OF RATS. *(Rus.)* Usacheva, N. T.; Nikolskaia, G. V.; Chernikov, M. P. (Inst. Nutr., Moscow, USSR). *Vopr. Pitan.* (6): 22-26, 1974.

0842 IMMUNOLOGIC CONTROL OF SOLUBLE PROTEIN ABSORPTION FROM THE SMALL INTESTINE: A GUT-SURFACE PHENOMENON. *(E.)* Walder, W. A.; Isselbacher, K. J.; Bloch, K. J. (Massachusetts Gen. Hosp., Boston). *Am. J. Clin.* 27(12):1434-1440, 1974.

0843 THE ABSORPTION OF ALG FROM THE GUT AND ITS LYMPHOCYTOPENIC EFFECT IN DOGS. *(E.)* Seifert, J.; Ring, J.; Brendel, W. (Surg. Clin., Univ. Munich, Germany). *Eur. Surg. Res.* 6(1):44-45, 1974.

0844 INTESTINAL ABSORPTION OF GLYCINE, L-ALANINE AND L-LEUCINE IN THE OLD RAT. *(E.)* Penzes, L. (Univ. Med., Budapest, Hungary). *Exp. Gerontol.* 9(5/6):245-252, 1974.

0845 THE INTESTINAL ABSORPTION OF VITAMIN B_{12}. *(E.)* Schjonsby, H.; Andersen, K. J. (Med. Dep. A, Univ. Bergen, Norway). *Scand. J. Gastroenterol.* 9(29):7-11, 1974.

0846 THE ACCUMULATION OF ADENOSINE IN RABBIT INTESTINAL MUSCLE. *(E.)* Hulme, M. E.; Weston, A. H. (Dep. Pharmacol., Univ. Manchester, England). *Br. J. Pharmacol.* 50(4):569-574, 1974.

0847 THE EFFECT OF PROTEIN SYNTHESIS INHIBITORS ON ZINC ABSORPTION BY RAT DUODENUM IN VIVO. *(E.)* Davies, N. T. (Rowett Res. Inst., Aberdeen, Scotland). *J. Physiol. (Lond.)* 244(1):38P-39P, 1975.

0848 THE EFFECTS OF ANGIOTENSIN ON FLUID TRANSPORT AND BLOOD FLOW IN RAT JEJUNUM. *(E.)* Bolton, J. E.; Munday, K. A.; Parsons, B. J. (Dep. Physiol., Univ. Southampton, England). *J. Physiol. (Lond.)* 244(1):27P-28P, 1975.

0849 EVALUATION OF CHROMIC OXIDE, GLYCEROL TRIETHER, AND β-SITOSTEROL AS FECAL FLOW MARKERS IN TWO SPECIES OF NONHUMAN PRIMATES. *(E.)* St. Clair, R. W.; Lehner, N. D. M.; Hamm, T. E. (Bowman Gray Sch. Med., Winston-Salem, N.C.). *Lipids* 10(1):25-32, 1975.

0850 REGULATION OF METABOLITE TRANSPORT IN RAT AND GUINEA PIG LIVER MITOCHONDRIA BY LONG CHAIN FATTY ACYL COENZYME A ESTERS. *(E.)* Shrago, E.; Shug, A.; Elson, C.; Spennetta, T.; Crosby, C. (Dep. Med., Univ. Wisconsin, Madison). *J. Biol. Chem.* 249(16):5269-5274, 1974.

0851 LIVER EXCRETORY MECHANISMS FOLLOWING PORTACAVAL SHUNT. *(E.)* Franco, D.; Chauvaud, S.; Grange, D.; Bismuth, H. (Paul-Brousse Hosp., Villejuif, France). *Eur. Surg. Res.* 6(Suppl. 1):2-3, 1974.

0852 BILIARY EXCRETION OF PHTHALEIN DYES: A SEPARATE PATHWAY FOR ROSE BENGAL? *(E.)* Mahu, J. L.; Arondel, J.; Dhumeaux, D.; Berthelot, P. (INSERM, Henri Mondor Hosp., Creteil, France). *Digestion* 10(4/5):366, 1974.

0853 THE MECHANISM OF AN INHIBITORY ACTION OF OXYTOCIN ON THE ISOTONIC FLUID TRANSPORT THROUGH THE GALL BLADDER EPITHELIUM. *(Rus.)* Iaremenko, M. S.; Kharlamova, O. N. (A. Bohomolets Inst. Physiol., Kiev, USSR). *Biull. Eksp. Biol. Med.* 77(11):10-12, 1974.

0854 ELECTRICAL PROPERTIES AND DIFFUSION POTENTIALS IN THE GALLBLADDER OF MAN, MONKEY, DOG, GOOSE AND RABBIT. *(E.)* Gelarden, R. T.; Rose, R. C. (Milton S. Hershey Med. Cent., Hershey, Pa.). *J. Membrane Biol.* 19(1/2):37-54, 1974.

See also, 0807, 0808, 0810, 1086, 1273, 1287.

MOTILITY

0855 FACTORS LIMITING GASTRIC EMPTYING DURING REST AND EXERCISE. *(E.)* Costill, D. L.; Saltin, B. (Dep. Physiol., Coll. Gymnast. Sports, Stockholm, Sweden). *J. Appl. Physiol.* 37(5):679-683, 1974.

A series of studies was undertaken to determine the effects of solute volume (200, 400, 600, 800 ml), temperature (5, 15, 25, 35 C), osmolarity (0-900 mOsm), and glucose concentration (139, 278, 556, 834 mM) on the rate of gastric emptying in 15 healthy males who served as their own controls. Additional observations were made to assess the effects of exercise intensity on the rate at which 400 ml of a glucose (139 mM) solution was removed from the stomach. At rest the addition of even small amounts of glucose (> 139 mM) induced a marked reduction in the rate of gastric emptying. The volume of fluid remaining in the stomach 15 min after ingestion was somewhat greater when the solution was 35 C as opposed to colder fluids ($P < 0.05$). The rate of gastric emptying increased in proportion to the volume ingested, with a maximal rate of emptying attained at a volume of 600 ml. In general, exercise had no effect on gastric emptying until the working intensity exceeded 70% $V_{max}O_2$. These data demonstrate the importance of minimizing the glucose content of solutions ingested in order to obtain an optimal rate of fluid replacement. In combination with high-intensity exercise even small amounts of carbohydrate can block gastric emptying.

See also, 0826, 0870, 0875.

SECRETION AND METABOLISM

0856 THE PRESENCE OF CYTIDINE 5'-MONOPHOSPHOSIALIC ACID: GLYCOPROTEIN SIALYLTRANSFERASE IN HUMAN SALIVA. *(E.)* Nakamura, R.; Tsunemitsu, A. (Dep. Prev. Dent., Hiroshima Univ., Japan). *J. Dent. Res.* 54(1):188, 1975.

0857 CHEMISTRY OF GASTROINTESTINAL HORMONES. *(E.)* Wunsch, E. (Max Planck Inst. Biochem., Munich, Germany). *Helv. Med. Acta.* 37(5/6): 307-320, 1974.

0858 INACTIVATION OF GASTRIN BY LYSOSOMAL ENZYMES. *(Ger.)* Hunziker, H. R. (Canton. Hosp., Aarau, Switzerland). *Helv. Med. Acta* 37 (5/6):357, 1974.

0859 INTESTINAL GLUCAGON. *(Ger.)* Muller, W. A. (Massachusetts Gen. Hosp., Boston). *Helv. Med. Acta* 37(5/6):321-330, 1974.

See also, 0821.

SECRETION AND METABOLISM

Stomach

0860 EFFECT OF ANGIOTENSIN AND ACTH ON GASTRIC SECRETION. *(E.)* Nasca, J. D.; Johnson, C.; Nance, F. C. (Dep. Surg., Louisiana State Univ., New Orleans). *Am. Surg.* 40(12):709-712, 1974.

The effects of angiotensin (1.7 μg/min i.v.) and ACTH (40 U/24 hr i.m.) alone or in combination were studied on pentagastrin (2 μg/kg/hr i.v.)-stimulated gastric acid secretion in 4 fasted mongrel dogs with gastric fistulas. Baseline gastric acid output in pentagastrin-stimulated dogs was about 4-6 mEq H^+/15 min. Addition of a constant ACTH administration caused no significant change in the gastrin-stimulated secretion. With the addition of angiotensin to the ACTH, background acid output decreased an approximate 75%. Infusion of angiotensin alone into pentagastrin-stimulated dogs caused a 60% decrease in acid production. The inhibition of acid release by angiotensin is best explained by its ability to cause marked splanchnic vasoconstriction resulting in decreased blood flow which in turn has been shown to reduce gastric secretion. The potentiation of this effect by ACTH may be mediated by higher levels of circulating angiotensin caused by the stimulation of renin release by ACTH.

0861 PLASMA GASTRIN LEVELS AND GASTRIC ACID SECRETION IN DOGS DURING ADMINISTRATION OF URECHOLINE. *(E.)* Sjodin, L.; Nilsson, G. (Karolinska Inst., Stockholm, Sweden). *Scand. J. Gastroenterol.* 9(8):747-750, 1974.

The effects of bethanechol (Urecholine), a stable choline-ester, were studied on gastric acid secretion and plasma gastrin levels of 4 fasted dogs with Heidenhain pouches and gastric cannulas. Continuous i.v. infusion of bethanechol (50 μg/kg-hr) over a 4 hr period stimulated gastric acid secretion to a value 40% of the mean maximal rate induced by histamine (4 mg/hr). Gastric secretion was stimulated to 66% of the maximal histamine-induced rate by 100 μg/kg-hr bethanechol. Neither concentration of bethanechol, however, significantly altered serum gastrin levels. Both doses produced some cholinergic side effects including salivation and vomiting. These results indicate that parietal cells are more sensitive to stimulation by bethanechol than are gastrin-releasing cells. Possible explanations for this include: 1) basal serum gastrin levels are sufficient to induce acid secretion in the presence of direct stimulation by bethanechol; or 2) bethanechol is stimulating release of substances which stimulate gastric acid secretion but which are not detected by the gastrin radioimmunoassay used in these studies.

0862 INTERACTION BETWEEN SECRETIN AND CHOLECYSTOKININ ON INHIBITION OF GASTRIC SECRETION IN MAN.

(E.) Henriksen, F. W.; Jorgensen, S. P.; Moller, S. (Rigshosp., Copenhagen, Denmark). *Scand. J. Gastroenterol.* 9(8):735-740, 1974.

The inhibitory effects of secretin (0.5-1.0 U/kg/hr i.v.) and cholecystokinin (0.5 and 1.0 Ivy dog U/kg/hr i.v.), given alone or in combination, on pentagastrin (0.15, 1.0 or 6.0 µg/kg/hr i.v.)-induced gastric acid secretion were studied in 6 healthy male and 6 healthy female fasted volunteers. Gastric fluid secretion was significantly decreased (12%) only when subjects given 6.0 µg/kg/hr pentagastrin received 10 U/kg/hr secretin. Gastric acid secretion, however, was significantly inhibited by all inhibitory infusions except for the lowest doses of secretin and cholecystokinin alone. When the low doses of secretin and cholecystokinin were given in combination, however, gastric acid secretion was inhibited to an extent (28%) greater than the sum of the degrees of inhibition seen when secretin or cholecystokinin were given alone (14%). This was not true for the higher individual doses where the degrees of gastric acid inhibition were also significantly increased for both secretin alone (14-23%) and for cholecystokinin alone (14-15%). Since the lower doses of agents given in these studies are most likely within the range of those released endogenously, it is concluded that the inhibition of gastric acid secretion resulting from the interaction of secretin and cholecystokinin is of physiologic importance in man.

0863 THE EFFECT OF PENTAGASTRIN, EXOGENOUS SECRETIN, AND CHOLECYSTOKININ (CCK) ON THE INTRINSIC FACTOR (IF) SECRETION IN MAN.

(E.) Vatn, M. H. (Ulleval Hosp., Oslo, Norway). *Scand. J. Gastroenterol.* [*Suppl.*] 9(29):53-56, 1974.

The effects of secretin and cholecystokinin on pentagastrin-stimulated intrinsic factor secretion were studied in fasted, healthy male and female volunteers. Three series of i.v. infusions were performed: 1) pentagastrin was given alone or in combination with secretin or cholecystokinin; 2) increasing doses of secretin or pentagastrin were given on the same day; 3) graded doses of pentagastrin were given on different days. Cholecystokinin caused a reduction of pentagastrin-stimulated intrinsic factor, acid, and pepsin output. Secretin caused a reduction of pentagastrin-stimulated acid and augmentation of pepsin output, whereas the output of intrinsic factor was unchanged. Basal intrinsic factor and acid output was reduced by increasing doses of secretin from 0.078 to 2.1 U/kg/hr, secondary to a reduction of volume. The output of pepsin was unchanged, owing to increased concentration. Stepwise increasing doses of pentagastrin, from 0.028 to 6.0 µg/kg/hr caused a continuous 2-hr secretion of intrinsic factor on a high plateau level, similar to that of pepsin. Infusion of a single dose caused a continuous low level secretion of intrinsic factor, contrasting the high level secretion for pepsin. The results suggest a dose-dependent relationship between pentagastrin and intrinsic factor, acid, or pepsin, with a different mode of secretion for the 3 substances of gastric juice.

0864 GASTRIC SECRETORY INHIBITION INDUCED BY THREE METHYL ANALOGS OF PROSTAGLANDIN E_2 ADMINISTERED INTRAGASTRICALLY TO MAN.

(E.) Nylander, B.; Andersson, S. (Karolinska Inst., Stockholm, Sweden). *Scand. J. Gastroenterol.* 9(8):751-758, 1974.

The effects of 3 alkylated analogs of prostaglandin E_2 (PGE$_2$) (15(S)-15-methyl PGE$_2$ methyl ester, 16,16-dimethyl PGE$_2$ and 16,16-dimethyl PGE$_2$ methyl ester) on the inhibition of pentagastrin-induced (0.6 µg/kg-hr, i.v.) gastric secretion were compared in 13 fasted healthy male volunteers. The analogs were administere by stomach tube 45 min prior to the start of pentagastrin infusion. All 3 analogs produced a dose-dependent effect with respect to inhibition of gastric acid secretion ($r = 0.88-0.98$) and duration of response, with an ED$_{50}$ of about 40 µg per subject (60-70% inhibition lasting about 1.5 hr). The inhibition of gastric acid output was primarily due to reduction of volume output which accounted for 80% of the effect. It is concluded that these prostaglandin analogs are potent inhibitors of gastric acid secretion and that they may eventually be useful in the treatment of peptic ulcer.

0865 EFFECT OF ATROPINE ON HYPOGLYCEMIC RELEASE OF GASTRIN IN MAN.

(E.) Stadil, F.; Malmstrom, J.; Rehfeld, J. F.; and Miyata, M. (Rigshosp., Copenhagen, Denmark. *Acta Physiol. Scand.* 92(3):391-398, 1974.

The effect of atropine on the insulin-produced hypoglycemic release of gastrin was studied in 9 fasted healthy male and female humans. Subjects served as their own controls and gastric acidity, acid output and serum gastrin levels were determined following injection of insulin (0.2 IU/kg i.v.) either alone or preceeded by 25 min with an injection of atropine (30 µg/kg im). Atropine alone had no effect on blood glucose or basal serum gastrin levels. Atropine caused a 60% reduction in peak gastric acid concentration and almost abolished acid output in response to insulin (about 75 mEq H$^+$/liter and 5 mEq H$^+$/15 min, resp). Serum gastrin levels following insulin injection reached a maximum (62 pgEq/ml) within 1 hr and remained elevated for 2-3 hr. Atropine caused a further stimulation of serum gastrin which showed a biphasic pattern with a second late increase (81 pgEq/ml) beginning 2 hr after insulin in 4 of the 9 subjects. The differences in gastrin response in the first hr after insulin injection were insignificant. The fact that the gastrin response to hypoglycemia was not decreased by atropine suggests that insulin-induced hypoglycemia caused release of gastrin independently of cholinergic excitation.

0866 CONDITIONING OF GASTRIC SECRETION BY EPINEPHRINE IN RATS. *(E.)* Guha, D.; Dutta, S. N.; Pradhan, S. N. (Howard Univ. Coll. Med., Washington, D.C.). *Proc. Soc. Exp. Biol. Med.* 147(3):817-819, 1974.

The conditioning of gastric secretion in response to a 30 sec, 3000 Hz tone was studied in male and female Wistar rats with gastric cannulas using epinephrine (0.2 mg/kg i.v.) as the unconditioned stimulus. Epinephrine caused a marked decrease in gastric fluid secretion (0.735 ml/hr) compared to saline-injected controls (1.495 ml/hr). In the hour preceeding epinephrine injection, however, a paradoxical increase was seen in the rate of gastric fluid secretion of the experimental group (1.777 ml/hr *vs* 1.509 ml/hr in controls) which was similar to the previously reported increase in salivation seen as a conditioned response to atropine. These results are attributed to an adaptive compensatory mechanism which anticipates the marked inhibition of gastric fluid release induced by epinephrine. The ability to condition this peripheral effect of epinephrine is not in agreement with Astrup's concept which holds that only centrally-mediated effects are conditionable.

0867 GASTRIN-INDUCED HYPOCALCEMIA IN THYROPARATHYROIDECTOMIZED RATS. *(E.)* Schulak, J. A.; Kaplan, E. L. (Univ. Chicago, Pritzker Sch. Med., Ill.). *Metabolism* 23(12):1103-1106, 1974.

The influence of i.v. gastrin injection (6-51 μg/rat) on serum calcium concentration was studied in fasted intact and thyroparathyroidectomized male Holtzman rats. Baseline calcium levels were 10.8-11.1 mg% for intact and 7.3-8.7 mg% for thyroidectomized rats. Thyroid intact rats showed a significant hypocalcemic response 30 min after injection of 12, 25 or 50 μg of synthetic human gastrin or of 12 or 25 μg porcine gastrin. The response was dose-dependent, dropping to 8.7 mg% and 9.2 mg% for human and porcine hormones, resp. Serum calcium returned to normal after 60 min in all animals. Significant transient hypocalcemic responses were also seen in thyroidectomized animals 30 min after injection of 25 μg synthetic human gastrin or 12 or 25 μg porcine gastrin with values of 7.3, 6.5 and 5.7 mg%, resp. These results suggest that gastrin-induced hypocalcemia is not solely dependent upon thyroid calcitonin release and action.

0868 THE INFLUENCE OF RESECTION OF THE SMALL INTESTINE ON GASTRIN LEVELS. *(E.)* Junghanns, K.; Kaess, H.; Dorner, M.; Encke, A. (Univ. Hosp., Heidelberg, Germany). *Surg. Gynecol. Obstet.* 140(1): 27-29, 1975.

The effects of small intestinal resection on serum gastrin levels were studied in 16 dogs with or without denervated gastric pouches. Fasting serum gastrin levels were significantly ($P < 0.05$) higher following resection (101.0 pg/ml) than prior to resection (87.6 pg/ml). Serum gastrin increase in response to feeding was significantly increased only in dogs with innervated Pavlov pouches which had their proximal small bowel resected. Levels reached about 155 pg/ml (1.5-fold greater than control) after 1.5 to 2 hr. Elevated serum gastrin in response to a meal was not so great (about 140 pg/ml, about 1.2-fold greater than control) in animals with resected distal small bowels. Serum gastrin levels were lower in the renal vein than in the renal artery and were lower in the portal vein than in the peripheral blood. These results suggest that the proximal small bowel, as well as the liver and kidney, plays an important role in the inactivation of endogenous gastrin.

0869 CORRELATION BETWEEN SERUM GASTRIN CONCENTRATION AND RAT STOMACH HISTIDINE DECARBOXYLASE ACTIVITY. *(E.)* Hakanson, R.; Kroesen, J. H.; Liedberg, G.; Oscarson, J.; Rehfeld, J. F.; Stadil, F. (Dep. Pharmacol., Univ. Lund, Sweden). *J. Physiol. (Lond.)* 243(2):483-498, 1974.

Serum gastrin concentration and stomach oxyntic mucosa histidine decarboxylase activity were measured simultaneously in fed or fasted adult male Wistar rats which had undergone 1 of the following surgical procedures: 1) vagal denervation with pyloroplasty, 2) antrectomy, 3) antral exclusion, 4) portacaval shunt with or without antrectomy, or 5) sham operation. In addition, some animals received injections of pentagastrin (500 μg/kg s.c.), insulin (2.5 or 10 U/kg s.c.), atropine (10 mg/kg i.p.), or hexamethonium (20 mg/kg i.p.) at various times prior to sacrifice. Freely fed sham-operated rats had much higher serum gastrin levels (153.0 pgEq/ml) and higher oxyntic mucosal histidine decarboxylase activity (35.9 pM CO_2/mg hr) than did fasted, sham-operated animals (35.1 pgEq/ml) and 5.8 pM CO_2/mg hr, resp.). In fasted antrectomized rats the serum gastrin concentrations were low (10.8) although in freely fed antrectomized rats it was the same as in fasted sham-operated rats. Enzyme activity was low (6.1-8.5) in both fasted and fed antrectomized rats. Vagotomized fasted rats had high serum gastrin (119) and high enzyme activity (67.8) whereas vagotomized fed rats had higher gastrin levels (229.2) but comparable enzyme activities. Highest gastrin levels and enzyme activities were seen in fasted antrally excluded rats (343 and 162.2, resp). Analysis by the method of least squares showed a positive correlation between serum gastrin concentration and mucosal histidine decarboxylase activity ($r = 0.69$). Insulin (10 U/kg) produced a slow, progressive increase in serum gastrin concentration in fasted, sham-operated rats which reached a peak (120 pgEq/ml) after 4 hr. An increase in enzyme activity paralleled the gastrin increase but reached a peak (80 pM CO_2/mg hr) 1 hr later. Portacaval-shunted, fasted rats showed a marked activation of gastric histidine decarboxylase following insulin injection which was a least 5 times greater than that in non-shunted rats; serum gastrin was only slightly higher. Shunted rats no longer responded to feeding with elevated enzyme activity following antrectomy indicating that the enzyme-activating agent was of antral origin. In shunted rats, pentagastrin produced an increase in enzyme activity to a level 5 times that of intact rats which was not reduced by antrectomy. These studies failed to provide evidence for the existence of a physiologic mediator other than gastrin that activates histidine decarboxylase following feeding, vagal stimulation or inhibition of gastric acid secretion.

0870 GASTRIC ORGAN CULTURE: A MODEL FOR REEPITHELIALIZATION. *(E.)* Hayashi, T.; Papla, B.; Stemmermann, G. N. (Kuakini Hosp., Honolulu, Hawaii). *Am. J. Pathol.* 78(1):23-32, 1975.

The cell kinetics of formation of a neoepithelial layer on the cut surfaces of human pyloric antral gastrectomy specimens was studied in organ culture. Light and electron microscopic studies showed that a layer of single epithelial cells began to cover the cut ends of the muscularis mucosae as early as 6 hr after the start of organ culture and that the entire reverse surface of the specimen was epithelialized within 24 hr. Cell outgrowth occurred from normal antral mucosa, from areas of atrophic gastritis and from areas of metaplasia with cells at all levels of differentiation participating in the process. The neoepithelial cells did not form on a basement membrane but rather aligned on collagen fibers or on amorphous interstitial matrix where there were fragments of membranes of disrupted cells and free subcellular organelles. Autoradiographs of sectioned gastric wall pre-labeled with ^{3}H-thymidine showed labeling in about 2% of the neoepithelial cells after 18-20 hr without any definite pattern or distribution of labeled cells; no mitotic figures were observed. A zone of cell extrusion formed in the center of the newly reepithelialized surface; cells in this region showed 3 types of change which appeared to preceed exfoliation: shrinkage necrosis, apoptosis and ballooning of the intercellular space. These findings suggest that differentiation within the neoepithelial cell layer is not the result of maturation during migration and that exfoliation is initiated by cell-cell contact and not by changes in the supporting lamina propria.

0871 GASTRIC AND PANCREATIC RESPONSES TO MEALS VARYING IN pH. *(E.)* Dembrinski, A.; Konturek, S. J.; Thor, P. (Med. Acad., Krakow, Poland). *J. Physiol. (Lond.)* 243(1):115-128, 1974.

Seven chronic gastric and pancreatic fistula cats were used to study the rates of gastric acid and pancreatic secretion in response to a test meal of 10% peptone at various pH values (1.0 to 5.0). Intragastric pH was adjusted by titrating with sodium bicarbonate. Introduction of peptone at pH 5.0 at a relative intragastric pressure of 0 cm resulted in an abrupt increase in gastric acid secretion (1.5 mEq H^+/15 min) which increased still more with increasing pressure up to 25 cm (2.0 mEq H^+/15 min) a value equal to 125-130% the maximum response seen with pentagastrin (16 µg/kg/M) or histamine (320 µg/kg/hr). Pancreatic fluid and bicarbonate outputs were also somewhat stimulated reaching a maximum (about 4 ml/15 min and 0.35 mEq/15 min, resp.) of about 50% of that obtained with exogenous secretin (4 U/kg/hr) at about 15 cm pressure and falling thereafter at higher pressures. Pancreatic protein output was, however, stimulated to a greater degree, reaching 85% of the maximum obtained with cerulein (1.6 µg/kg/hr) at 20-25 cm pressure. When gastric response to a peptone meal was studied over a range of pH values (1.0-5.0), increased acid production occurred at pH values >3.0 with a maximum at pH 4.0 (about 1.7 mEq H^+/15 min) and only a 30% response at pH 1.0 (about 0.4 mEq H^+/15 min). Pancreatic secretory volume and bicarbonate output were, however, stimulated (70% of maximal secretion seen at pH 3.0) at pH values which inhibited gastric acid secretion. The changes in gastric and pancreatic secretion response to a peptone meal at pH 5.0 were reproduced by administration of 1.0 U/kg/hr secretin suggesting that in the cat secretin may be responsible for the gastric inhibitory and pancreatic stimulatory mechanism activated during normal digestion of food.

0872 CONTROL OF GASTRIC ACID SECRETION BY HISTAMINE H_2-RECEPTOR ANTAGONISTS: A PHARMACOLOGICAL DREAM COME TRUE? *(E.)* Ivey, K. J. (R. Prince Alfred Hosp., Camperdown, Australia). *Aust. NZ J. Med.* 4(5):521-524, 1974.

0873 HISTAMINE-STIMULATED HYDROGEN ION SECRETION BY IN VITRO PIGLET GASTRIC MUCOSA. *(E.)* Forte, J. G.; Forte, T. M.; Machen, T. E. (Inst. Anim. Physiol., Cambridge, England). *J. Physiol. (Lond.)* 244(1):15-31, 1975.

0874 CONTROL FACTORS IN THE RELEASE OF GASTRIN BY DIRECT ELECTRICAL STIMULATION OF THE VAGUS. *(E.)* Smith, C. L.; Kewenter, J.; Connell, A. M.; Ardill, J.; Hayes, R.; Buchanan, K. (Univ. Cincinnati Med. Cent., Ohio). *Am. J. Dig. Dis.* 20 (1):13-22, 1975.

0875 INTRAGASTRIC PRESSURE/VOLUME RELATIONSHIP AND GASTRIN RELEASE AFTER DISTENTION OF SEPARATE PARTS OF THE STOMACH. *(E.)* Stadaas, J.; Schrumpf, E. (Ulleval Univ. Hosp., Oslo, Norway). *Scand. J. Gastroenterol.* 9(8):781-785, 1974.

0876 GASTRIC SECRETORY INHIBITION BY CERTAIN METHYL ANALOGS OF PROSTAGLANDIN E_2 FOLLOWING INTESTINAL ADMINISTRATION IN MAN. *(E.)* Nylander, B.; Robert, A.; Andersson, S. (Karolinska Hosp., Stockholm, Sweden). *Scand. J. Gastroenterol.* 9(8):759-562, 1974.

0877 THE PEPSINS OF HUMAN GASTRIC JUICE. SEPARATION BY ELECTROPHORESIS AND CHROMATOGRAPHY; THE INFLUENCE OF GASTRIC DISEASE AND AMBIENT pH. *(E.)* Whitecross, D. P.; Clarke, A. D.; Piper, D. W. (R. North Shore Hosp., Sydney, Australia). *Scand. J. Gastroenterol.* 9(8):711-717, 1974.

0878 SOLUBLE AND BOUND PROTEIN KINASES OF RABBIT GASTRIC SECRETORY CELLS. *(E.)* Ray, T. K.; Forte, J. G. (Dep. Physiol. Anat., Univ. California, Berkeley). *Biochem. Biophys. Res. Commun.* 61(4):1199-1206, 1974.

See also, 0805, 0824, 0836.

SECRETION AND METABOLISM

Pancreas

0879 AN ENZYME WITH COLLAGENOLYTIC ACTIVITY FROM DOG PANCREATIC JUICE. *(E.)* Takahashi, S.; Seifter, S. (Albert Einstein Coll. Med., Yeshiva Univ., Bronx, N.Y.). *Isr. J. Chem.* 12(1/2):557-571, 1974.

The purification and characterization and radioactive assay of a collagenase isolated from the pancreatic juice of dogs prepared with pancreatic fistulae and stimulated to secrete the enzyme by injection of high quality pancreozymin is described. The purification steps included the use of affinity chromatography employing a Sepharose-collagen column. The isolated enzyme had relatively high specific activity, was able to digest extracted, undenatured collagen to peptides of relatively small size, and could act on so-called insoluble beef tendon collagen. The canine pancreatic collagenase was inhibited by diisopropylphosphorofluoridate in relatively high concentrations, cysteine, glycoproteins, human serum, and to a small extent, by soybean trypsin inhibitor. It is suggested that just as carnivorous mammals have evolved with a specific elastase homologous with trypsin and chymotrypsin, they also have evolved in some instances with a specific collagenase; its homology with the other serine proteases is not yet established, although it appears to have properties intermediate between those of a serine protease and those of most tissue collagenases. A radioactive assay for collagenase was developed using a mild treatment with trypsin, which acts only in those sections of the collagen moiety that do not contain the typical collagen helix, and then reacting this material with tritiated sodium borohydride. This treatment causes the introduction of tritium at the sites of aldehyde and aldol crosslinks that were reduced. Subsequent action of an enzyme with collagenolytic activity releases soluble peptides containing tritium; the extent of proteolytic action may then be measured by the radioactivity of the supernatant.

0880 THE PANCREATIC SECRETION OF ENZYMES IN RATS TREATED WITH SOYBEAN DIET. *(E.)* Folsch, U. R.; Wormsley, K. G. (Dep. Med., Univ. Gottingen, Germany). *Scand. J. Gastroenterol.* 9(7):679-683, 1974.

The secretory response to cholecystokinin-pancreozymin (CCK-PZ) and secretin was studied in male Wistar rats which had been treated with a 20-day course of either raw (RSF) or heated (HSF) soybean flour. Experiments were performed on the rats following a 24-hr fast. A glass cannula was placed in the trachea and pancreatic enzymes collected by perfusing the duodenum with 0.15 M NaCl (7.5 ml/15 min). After basal secretion had been collected for 4 successive 15-min periods, secretin and CCK-PZ were infused i.v. at a rate of 1.65 ml/hr. The dose schedules provided submaximal, maximal, and supramaximal stimulation: 1) 7.5 Ivy U/kg-hr CCK-PZ combined with 0.5 clinical U/kg-hr secretin; 2) 60 Ivy U/kg-hr CCK-PZ combined with 0.5 clinical U/kg-hr secretin; and 3) 240 Ivy U/kg-hr CCK-PZ combined with 0.5 clinical U/kg-hr secretin. Only 1 dose combination was used in each animal. Each infusion of hormones lasted for 3 hr and was studied in 3 animals. After an initial weight loss in both the RSF and HSF groups, the HSF-treated rats gained 2.5 times more weight than the RSF-fed rats during the 20-day period. The basal secretion of amylase ranged from 1-9 mM maltose/15 min/100 g during a 4-hr period. Basal secretion of trypsin could not be detected in either group. The peak rate of secretion of trypsin in both groups of rats was attained in all experiments within the first 75 min of the onset of stimulation. The output of trypsin decreased rapidly after reaching a peak rate of secretion. The pattern of secretion of amylase resembled that of trypsin. The overall biphasic pattern of enzyme secretion of the RSF rats was not different from the control (HSF) rats, and the maximal rate of secretion of trypsin was identical in the 2 groups of rats. Outputs of amylase and trypsin, however, were significantly increased in the RSF animals compared with control in response to the submaximal and supramaximal doses of CCK-PZ, because the secretion of enzymes was better sustained in the RSF rats than in the control rats. It is concluded that despite the very marked histological changes in the pancreas of rats treated with RSF, the pattern of secretory response to stimulants of the hypertrophied gland is not qualitatively different from normal.

0881 NUTRITIONAL AND HORMONAL EFFECTS ON RNA POLYMERASE ENZYME ACTIVITIES IN PANCREAS. *(E.)* Black, Jr., O.; Webster, III, P. D. (VA Hosp., Augusta, Ga.). *Am. J. Physiol.* 227(6):1276-1280, 1974.

The responses of DNA-dependent RNA polymerase I and polymerase II enzyme activities were studied in pigeon pancreas in response to fasting, cholinergic, and hormonal stimulation. Following 72 hr of fasting, polymerase I and II activities, which were measured as incorporation of $[^{14}C]$ uridine triphosphate, decreased by 58% and 89%, resp. Nuclear RNA content decreased 23%. None of these changes was associated with increased RNase activity. In response to bethanechol chloride (2 mg/kg) and cholecystokinin-pancreozymin (CCK-PZ) (15 U/kg), polymerase I activity increased in a differential manner. Both increased the quantities of 28-S and 18-S RNA species. Enzyme activities in bethanechol chloride treated pigeons increased within 10 min but there was no significant change in polysomal RNA after 50 min. Pancreases from (CCK-PZ) treated pigeons showed increased polysomal RNA within 15 min after maximum enzyme activity was observed. Polymerase II enzyme activities increased with both drugs to a maximum 45 min after administration. The evidence indicates that: 1) the pancreas changes in nuclear ribosomal RNA synthesis as a result of fasting, cholinergic, and hormonal stimulation; 2) the stimulated RNA synthesis resulting from (CCK-PZ) and bethanecol chloride stimulation occurred at a time when protein synthesis was inhibited and energy supply was low; and 3) the pancreas responds to hormonal stimulation more rapidly than other tissues.

0882 SUBCELLULAR CHANGES IN PROTEIN METABOLISM AND MAGNESIUM CONTENT OF THE PANCREAS IN RATS FED TWO LEVELS OF DIETARY PROTEIN AND MAGNESIUM.

(E.) Greger, J. L.; Schwartz, R. (Coll. Hum. Ecol., Cornell Univ., Ithaca, N.Y.). *J. Nutr.* 104(12):1618-1629, 1974.

The subcellular distribution of Mg^{++} as determined by atomic absorption spectrophotometry and the incorporation of i.v. injected ^{14}C-valine into pancreatic proteins were studied in 120 male Sprague-Dawley rats. Animals were fed a diet for 10 days containing 15 or 30% casein and 50 or 100 ppm Mg^{++} with or without fasting for 24 hr prior to sacrifice. The rates of protein synthesis and secretion were estimated by determining the label present in the acid soluble and insoluble portions of pancreatic microsomal, zymogen and supernatant fractions 5, 45 and 120 min after injection of ^{14}C-valine. Protein specific activity was decreased in the acid soluble microsomal fraction, the acid soluble supernatant fraction and the total mitochondrial fraction of fasted Mg^{++} deficient rats 2 hr after ^{14}C-valine injection. Mg^{++} levels in the zymogen, supernatant, mitochondrial and nuclear plus cellular debris fractions were unaffected by diet content although refeeding resulted in decreased zymogen and supernatant Mg^{++}. Total microsomal Mg^{++} content, however, was significantly greater in both fasted and refed rats fed the 30% casein, 100 ppm Mg^{++} diet than in rats fed 50 ppm Mg^{++} diets or the 15% casein, 100 ppm Mg^{++} diet. Acid soluble microsomal Mg^{++} content was 5- to 10-fold greater than acid insoluble content. These results provide little, if any, evidence of significant shifts in the intracellular distribution of Mg^{++} with changes in diet.

0883 REGULATION OF PANCREATIC ACINAR FUNCTION: EFFECTS OF CYCLIC AMP, DIBUTYRYL CYCLIC AMP, AND THEOPHYLLINE IN VITRO.

(E.) Haig, T. H. B. (Dep. Surg., Univ. Saskatchewan, Saskatoon, Canada). *Can. J. Physiol. Pharmacol.* 52(4):780-785, 1974.

The role of cyclic AMP in the regulation of pancreatic acinar function was assessed by measuring the effects of exogenous cyclic AMP, dibutyryl cyclic AMP, and theophylline on protein synthesis and amylase secretion in slices of rat pancreas. Pancreas slices from 1 healthy male albino rat were used for each experiment. The slices were placed in a vial with 2 ml of tissue culture medium containing 0.20 µCi/ml of L-leucine-^{14}C plus the stimulant(s) to be tested. Experiments testing cyclic AMP and dibutyryl cyclic AMP were run using 10 min and 160 min incubation times (the former for measuring secretion and the latter measuring synthesis), and 3 concentrations of cyclic nucleotide (2×10^{-3} M, 1×10^{-3} M, and 0.5×10^{-3} M) plus 2 concentrations of pancreozymin (5 U/ml and 2.5 U/ml), as well as a control. Theophylline was assesse using the same 2 incubation times and testing 2 concentrations (10^{-3} M and 10^{-4} M) with and without pancreozymin (5 U/ml and 2.5 U/ml). Six animals were tested in each of the 3 sets of experiments. After the selected incubation time, the medium was pipetted from each vial and assayed for amylase activity, and for L-leucine-^{14}C incorporation into protein. In this test system, the rate at which slices of rat pancreas incorporated leucine into protein did not change as a consequence of treatment with either cyclic AMP or dibutyryl cyclic AMP, nor did the slices alter their rate of amylase secretion. In contrast, rat pancreas slices secreted amylase vigorously in response to pancreozymin, while simultaneously decreasing their mean rate of protein synthesis. Theophylline did not enhance the ability of submaximal doses of pancreozymin to stimulate amylase secretion or to suppress protein synthesis. These results fail to demonstrate that cyclic AMP regulates either the synthesis or secretion of pancreatic digestive enzymes but they do not rule out the possibility.

0884 PANCREATIC ACINAR CELLS: EFFECTS OF LANTHANUM IONS ON AMYLASE RELEASE AND CALCIUM ION FLUXES.

(E.) Chandler, D. E.; Williams, J. A. (Dep. Physiol., Univ. California, San Francisco). *J Physiol. (Lond.)* 243(3):831-846, 1974.

The effect of La^{+++} on amylase release and Ca^{++} fluxes in mouse pancreatic fragments *in vitro* was studied. Amylase release was increased by 0.1 mM La^{+++} and progressively inhibited by 1.0-10 mM La^{+++}. Non-stimulated and bethanecol stimulated secretion were altered in an identical manner. Inhibition of amylase release was rapid and reversible. Uptake of $^{45}Ca^{++}$ was multiphasic with equilibrium with stable Ca^{++} still not complete after 2 hr. La^{+++} (10 mM) limited uptake of $^{45}Ca^{++}$ to the extracellular space and slightly decreased total Ca^{++} content. Lower concentrations of La^{+++} affected $^{45}Ca^{++}$ uptake and total Ca^{++} content in a biphasic manner which paralleled effects on amylase release. La^{+++} restricted washout of $^{45}Ca^{++}$ to isotope in the extracellular space and abolished the bethanecol-stimulated increase in $^{45}Ca^{++}$ efflux. Uptake of $^{45}Ca^{++}$ into intracellular space was not affected by bethanecol. Tissue ultrastructure and Na^{+} and K^{+} content were not affected by La^{+++}. It is concluded that an influx of extracellular Ca^{++} is not important for triggering of secretion and that La^{+++} may inhibit amylase release by acting on the release process rather than on Ca^{++} influx.

885 PANCREATIC EXOCRINE SECRETION DURING AND AFTER PREGNANCY. *(E.)* Rosenberg, V.; udick, J.; Robbiou, M.; Dreiling, D. A. (Mt. Sinai ch. Med., City Univ. New York, N.Y.). *Ann. Surg.* 81(1):47-50, 1975.

ancreatic secretion was evaluated in 8 pregnant ongrel dogs prepared with Thomas duodenal and gas- ric fistulas, during pregnancy at a time corre- ponding to the third trimester in humans, during he puerperium, and several months after whelping. asal secretion increased in volume from 0.85 to .87 ml/10 min during pregnancy and to 1.74 ml/10 in during puerperium. Mean bicarbonate concentra- ion of 49.4 mEq/liter rose to 79.5 and 74.6 mEq/ iter during pregnancy and in the puerperium, resp. icarbonate output was increased by 319% during regnancy and 211% in the puerperium. The response o exogenous secretin, submaximal and maximal, was nchanged during pregnancy but decreased in the uerperium. Enzyme output in the resting state was ncreased by 73% during pregnancy and 35% in the uerperium. The responses to cholecystokinin- ancreozymin was markedly increased during preg- ancy but not in the puerperium. Enzyme responses o cholecystokinin-pancreozymin during pregnancy ere increased not only in output but also in con- entration. Although the precise mechanism is not lear, the alterations in pancreatic exocrine func- ion observed here could contribute to the pan- reatitis of pregnancy and the puerperium.

886 GLUCOSE-INDUCED INSULIN SECRETION AND PATTERN OF EXOCRINE PANCREATIC ENZYMES IN THE AT FOLLOWING ORAL AND PARENTERAL TRYPSIN INHIBITOR DMINISTRATION. *(E.)* Ihse, I.; Arnesjo, B.; Lund- uist, I. (Dep. Surg., Univ. Lund, Sweden). *Scand. . Gastroenterol.* 9(8):719-724, 1974.

The pancreatic enzymic pattern and endocrine function were compared after long-term oral or i.p. administration of bovine lung trypsin inhibitor to male Wistar rats. One daily dose of trypsin inhibitor was administered orally (100,000 Kallikrein-inhibiting U in 1 ml water by gastric intubation) or i.p. (1 ml 100,000 Kallikrein-inhibiting U/ml) every morning for 3 weeks. After oral administration the wet weight and the protein content of pancreas were increased. The pancreatic trypsinogen increased in a more pronounced way than the amylase and lipase activities. The trypsin-inhibitor-treated group showed a decreased insulin secretory response 3 and 7 min after i.v. glucose administration (0.75 g/kg) and 30 and 60 min after p.o. ingestion of a 30% glucose solution (1 ml/100 g). The glucose tolerance was normal or even increased. No changes in pancreatic wet weight, protein content, enzyme pattern, and endocrine pancreatic function were found after i.p. trypsin inhibitor administration. The results support the hypothesis that the effects on exocrine and endocrine rat pancreatic functions of trypsin inhibitor treatment require the mediation of the gastrointestinal tract.

0887 THE INFLUENCE OF REDUCED PANCREATIC BLOOD FLOW ON STIMULATED EXOCRINE PANCREATIC FUNCTION. *(E.)* Laszcz, M.; Zimmermann, G.; Umlauft, M.; Boeckl, O. (Ludwig Boltzmann Inst. Exp. Surg., Salzburg, Austria). *Eur. Surg. Res.* 6(1):59-60, 1974.

See also, 0871, 0903, 1106.

SECRETION AND METABOLISM

Hepatobiliary Tract

888 STUDIES ON THE PATHOGENESIS OF EXPERIMENTAL CHRONIC ACTIVE HEPATITIS IN RABBITS: II. DEMONSTRATION OF IMMUNOGLOBULIN ON ISOLATED HEPATO- YTES. *(E.)* Hopf, U.; Meyer Zum Buschenfelde, K. H. (2nd Dep. Intern. Med., Univ. Mainz, Germany). *Br. . Exp. Pathol.* 55(5):509-513, 1974.

Immunofluorescence studies were conducted on hepato- ytes isolated from white New Zealand rabbits with irrhosis and chronic active hepatitis experimentally induced by repeated immunization (25-41 injections ver 79-143 week) with human liver protein (5-15 mg .p. each injection) plus complete Freund's adjuvant. Immunoglobulin could be demonstrated on the hepato- yte membranes of 8 of 9 animals with chronic active epatitis. The 1 animal with cirrhosis showed no embrane fixed immunoglobulin. Of 8 animals without liver lesions which had been immunized with both human and rabbit liver protein, only 1 showed a weak mem- rane fluorescence. The presence or absence of liver lesions had no effect on serum antibody titers against liver specific proteins as tested for by passive hemagglutination and gel diffusion. A positive skin test to rabbit liver protein correlated with the development of liver lesions. These results are consistent with an antibody mediated lymphocyte toxicity as mediator for the development of chronic active hepatitis under these conditions.

0889 MORPHOLOGICAL STUDIES ON THE RAT LIVER AND A BIOCHEMICAL ANALYSIS OF THE SERUM FOLLOWING EXPERIMENTAL LIGATURE OF THE THORACIC DUCT. *(E.)* Cremer, H.; Muller, N.; Bechtelsheimer, H. (Inst. Pathol., Univ. Bonn, Germany). *Lymphology* 7(2):69-80, 1974.

Light microscopic studies and serum determinations of various liver enzyme activities were conducted on livers of 308 white male and female Sprague-Dawley rats following induction of hepatic lymphedema by ligature of the thoracic duct. Following thoracic duct ligations, the spaces of Disse and Mall as well as the lymphatic vessels in the portal tracts and the lymphatics along the hepatic veins became dilated. Necrosis of the hepatocytes along the periphery of the liver lobules were seen and there was evidence of formation of lymphobiliary fistulas. These morphological changes regressed somewhat after 12-15 days. Within the 1st day following thoracic duct ligation, serum enzyme activities as determined photometrically showed a 4-fold increase in LDH and approximately 3- and 2-fold increases in SGOT and SGPT, resp. Serum alkaline phosphatase activity showed a 60% decrease during the 1st day and remained depressed throughout the 90 days of the experiment. Serum triglyceride levels also decreased by 60% the 1st day, returned to normal, and showed another 50% decrease on day 15. Total lipid and cholesterol values did not differ significantly from pre-experimental values. It was concluded that the observed morphological and biochemical changes were secondary to hepatic lymphedema and that the implications of these findings may be applied in the management of various liver diseases (e.g., liver transplants and carcinomatous lymphangiosis) in which hepatic lymphatic blockage may be significant.

0890 UNUSUAL LYSOSOMES IN HAMSTER HEPATOCYTES.

(E.) Nehemiah, J. L.; Novikoff, A. B. (Albert Einstein Coll. Med., Yeshiva Univ., Bronx, N.Y.). *Exp. Mol. Pathol.* 21(3):398-423, 1974.

Light and electron microscopic studies were conducted on the hepatic lysosomes from male and female Syrian golden hamsters fed either a normal or a cholesterol-supplemented diet (2%) for up to 10 months. Unlike the usual electron dense lysosomes usually observed in mammalian hepatocytes, some of these displayed a relatively large lipid inclusion which could be stained with oil red O and were also acid phosphatase positive. The acid phosphatase activity was limited to the area immediately around the lipid inclusion and, in most cases, to a region at one pole of the lysosome which was typically electron-dense. These lipid-containing lysosomes were increased in the livers of male and female animals maintained on the cholesterol-supplemental diet, appearing first in periportal hepatocytes but later also in centrilobular hepatocytes. Frozen liver sections from these hamsters showed the characteristic "Maltese cross" birefrigence of cholesterol-containing lipids. Liver cholesterol levels as determined by chemical means rose rapidly following a single feeding of the cholesterol-supplemented diet and reached levels 30-fold greater than controls after 3 weeks. Electron microscopic studies suggested that the lipid inclusions were forming in the Golgi-associated endoplasmic reticulum or in the neighboring endoplasmic reticulum proper since their membranes appeared to be continuous with those of the lipid-containing lysosomes. Removal from the cholesterol-supplemented diet resulted in the gradual disappearance of the electron-lucent lipid with the lysosomes coming to resemble lipofuscin granules. Thus, hamster liver may serve as a model for inherited disorders of lipid metabolism and other diseases in which electron-lucent lipid accumulates within lysosomes.

0891 LIVER REGENERATION AFTER PORTACAVAL TRANSPORTATION IN RATS.

(E.) Lee, S.; Broelsch C. E.; Flamant, Y. M.; Chandler, J. G.; Charters, III A. C.; Orloff, M. J. (Sch. Med., Univ. California San Diego, La Jolla). *Surgery* 77(1):144-149, 1975.

Liver regeneration was studied in 40 partially hepate tomized inbred male Lewis rats which had previously undergone either sham operation, an end-to-side porta caval shunt or a portacaval transposition. Six crite were used to evaluate regeneration: wet weight, dry weight, protein content, mitotic index, percent label nuclei following ^{3}H-thymidine injection, and rate of incorporation of ^{3}H-thymidine into liver DNA. By all criteria except mitotic index, active regeneration occurred in all experimental groups, although somewha less rapidly than that of the sham operated controls. Mitotic indices were significantly greater in livers of animals with portacaval shunts than in those with the added benefit of a substitute systemic venous flow. These results thus indicate that there is no added regenerative benefit afforded by substitution of a systemic venous flow for portal flow to the live

0892 ADENINE NUCLEOTIDE METABOLISM IN REGENERATIVE, ATROPHIC, AND NECROTIZING PROCESSES OF THE LIVER.

(E.) Ozawa, K.; Takeda, H.; Tamaoka, Y.; Nambu, H.; Kamiyama, Y.; Honjo, I. (Kyoto Univ. Fac. Med., Japan). *Gastroenterology* 67(6):1225-1230, 1974.

Mitochondrial adenine nucleotide metabolism was studi during regenerative, atrophic, and necrotizing processes of liver in mammals subjected to ligation of the left portal vein or the common bile duct. Phosphorylase activity per unit of cytochrome $(a+a_3)$ of isolated liver mitochondria from ligated lobes was decreased to about 50% of the sham-operated control value within 12 hr of ligation and remained relativel constant for the remaining 5.5 days of the experiment The energy charge (ATP+½ADP/ATP+ADP+AMP) decreased by about 40% immediately following ligation but returned to normal on the 4th day. Measurement of hepatocellular adenine nucleotide concentrations by an enzymatic method showed that ATP remained unchanged but ADP, AMP and total adenine nucleotide concentrations decreased significantly following common duct ligation; ADP, AMP and total adenine nucleotide concentrations were increased in the non-ligated lobes. Phosphorylase specific activity was the same in normal liver mitochondria from man, monkey, dog and rabbit but was decreased up to 50% in monkey, dog and rabbit folowing portal vein ligation; phosphorylase specific activity from the non-ligated lobes was abou 45% higher than that from normal liver. Phosphorylase specific activity was decreased to about 35% and adenine nucleotide concentration fell to 50% or less than that of normal liver in severely injured livers of icteric rabbits subjected to common bile duct ligation. Most of these animals died of hepatic insufficiency within 3 days. These results indicate that phosphorylase specific activity increases in regener-

ng liver and decreases in atrophic (especially
crotizing) processes. The major feature of the re-
nerative process appears to be an increase in the
pacity for aerobic metabolism.

3 ROLE OF INSULIN AS A PORTAL FACTOR IN MAINTAINING THE VIABILITY OF LIVER. *(E.)*

awa, K.; Yamada, T.; Honjo, I. (Kyoto Univ. Fac.
l., Japan). *Ann. Surg.* 180(5):716-719, 1974.

e effect of insulin on hepatic mitochondrial oxi-
tive phosphorylation was studied in adult male
star rats subjected to ligation of the left por-
l vein. Simultaneous s.c. administration of in-
lin (2.5 U/kg) and intragastric intubation of glu-
se (400 mg/200 gm) had no effect after 2 hr on the
spiratory control ratio, state 3 respiration, P:O
tio and phosphorylase activity of normal hepatic
tochondrial preparations from non-ligated rats.
llowing ligation of the left portal vein, liver
tochondrial phosphorylase activity decreased within
hr from 110 to 60 mM ATP/mg protein/min with glu-
mate as substrate. Administration of insulin
.25-2.5 U/kg) to ligated rats resulted in up to more
an a 2-fold increase in the rate of hepatic mito-
ondrial phosphorylation. Kinetic studies of phos-
orylase activity in ligated rat livers following
c. injection of 2.5 U/kg insulin showed a rapid
imulation within 30 min to a value 200% of control
thin 2 hr ($P < 0.005$) with a subsequent fall to
normal levels. The respiratory control ratio,
ate 3 respiration and P:O ratio were maximally in-
eased in parallel with the increased phosphorylase
tivity. Respiratory enzyme concentrations, however,
mained unchanged. It is suggested that insulin may
diate mitochondrial metabolism by affecting levels
a previously reported portal vein factor which can
imulate mitochondrial oxidative phosphorylation.

94 ALBUMIN, FIBRINOGEN AND TRANSFERRIN SYNTHESIS IN ISOLATED RAT HEPATOCYTE SUSPENSIONS: MODEL FOR THE STUDY OF PLASMA PROTEIN SYNTHESIS.

.) Jeejeebhoy, N.; Ho, J.; Greenberg, G. R.; Phil-
ps, M. J.; Bruce-Robertson, A.; Sodtke, U. (Dep.
d., Univ. Toronto, Canada). *Biochem. J.* 146(1):
1-155, 1975.

model system for studying synthesis of albumin,
brinogen and transferrin has been established using
spension cultures of hepatocytes from healthy Wis-
r rats. Optimum culture conditions for survival
d protein synthesis included an enriched medium
ing 17.5% heat-inactivated horse serum, constant
irring and an O_2 tension between 18.7×10^3 and
$.7 \times 10^3$ Pa. Solid-phase radioimmunoassay showed
at the rates of synthesis of albumin, fibrinogen
d transferrin were 0.32, 0.12 and 0.097 mg/hr/g of
patocytes, resp. These rates were maintained for
e first 12 hr after which they decreased to lower
vels which were maintained for up to 48 hr. Albu-
n synthesis was decreased but fibrinogen synthesis
s unchanged in relatively amino acid- and glucose-
ficient medium. ATP concentration and the RNA:DNA
tio of cells incubated up to 12 and 24 hr, resp., were comparable to those of hepatocytes *in vivo*. Estimates of protein synthesis of hepatocytes maintained for 48 hr in medium supplemented with a hormone mixture consisting of glucagon (0.75 ng/ml), cortisol (0.25 μg/ml), triiodothyronine (0.09 μg/ml) and bovine growth hormone (0.5 μg/nl) increased fibrinogen synthesis by over 2-fold but had no effect on albumin or transferrin synthesis. Addition of insulin (20 μU/ml) increased albumin and transferrin synthesis by about 35% but did not further stimulate fibrinogen synthesis. This system thus responds in a manner comparable to that *in vivo* and in long-term perfused whole liver and may thus prove useful for *in vitro* testing of hepatotropic factors.

0895 EFFECTS OF OCTANOATE AND OLEATE ON ENERGY METABOLISM IN THE PERFUSED RAT LIVER. *(E.)*

Debeer, L. J.; Mannaerts, G.; De Schepper, P. J. (Sch. Med., Cathol. Univ. Louvain, Belgium). *Eur. J. Biochem.* 47(3):591-600, 1974.

Livers from fasted male Wistar rats (100-120 g) were perfused with octanoate or oleate added as a single dose after an equilibration period of 28 min and the perfusions stopped at 35 or 60 min. Octanoate as well as oleate induced a net decrease in ATP and an increase in AMP content of the liver. Total adenine nucleotides were unaltered. ATP:ADP ratios were lowered while the adenylate kinase mass-action ratio increased. In other experiments, livers from fasted rats were perfused without substrate for 58 min, after which substrate was added to obtain an initial concentration of 1 mM or 5 mM octanoate, 1 mM oleate or 10 mM lactate. The Krebs cycle activity was suppressed by both fatty acids and enhanced by lactate. Oxidation at C-3 was strongly stimulated by the fatty acids and was unaffected by lactate. An apparent ADP:O ratio of 2.7 was obtained after lactate addition, indicating a tightly coupled oxidative phosphorylation for the liver preparations used. Octanoate and oleate gave extremely low ratios of near one and near zero resp. Perfusion with oligomycin (1 mg/100 ml perfusion medium) caused a severe drop in oxygen uptake by the liver, which was unaltered after addition of fatty acids. Oligomycin added after the fatty acids caused an immediate fall in oxygen uptake to the level observed with oligomycin alone. 2,4-Dinitrophenol (1 mM) was able to stimulate the oligomycin-depressed respiration, both in the absence and in the presence of fatty acids. Under these experimental conditions, therefore, the fatty acids had no uncoupling effect and microsomal fatty acid oxidation was minimal. Incorporation of [^{3}H]leucine (10 μCi added to the perfusion medium) into proteins in liver and medium remained unchanged after addition of fatty acids, indicating that the low apparent ADP:O ratios are not the result of an enhanced synthesis of proteins.

0896 AGE-DEPENDENT INDUCTION AND REPRESSION OF RAT LIVER MICROSOMAL HYDROXYLASE SYSTEMS BY ESTRADIOL. *(E.)*

Gustafsson, J. A.; Ingelman-Sundberg, M. (Karolinska Inst., Stockholm, Sweden). *Biochim. Biophys. Acta* 354(2):172-181, 1974.

The activities of the hepatic microsomal 2α-, 2β-, 18- and 7α-hydroxylase systems active on 5α[4-^{14}C]-androstane-3α,17β-diol were studied in male and female Sprague-Dawley rats. Animals were castrated and spayed at 14, 24, 35 and 45 days of age, treated for 5 days with 500 μg of estradiol benzoate i.m./kg and killed 6 days after gonadectomy. The hepatic microsomal 15β-hydroxylase enzyme system active on 5α-[1,2-^{3}H]androstane-3α,17β-diol 3,17-disulphate was also measured in these animals as well as in an additional group of animals that were gonadectomized at 56 days of age, treated with estradiol benzoate and killed at 62 days of age. The hydroxylase systems active on the free steroid substrate were all relatively unresponsive towards estradiol in the developing rat, in contrast to the strong effects on hepatic hydroxylase activities previously noted following treatment of adult male rats with estradiol. On the other hand, the 15β-hydroxylase system active on disulphurylated 5α-androstane-3α,17β-diol was inducible in both male and female rats of 41 and 51 days of age and in male rats of 61 days of age. These results may be explained at least in part by variations in concentration, during different stages of development, of the cytoplasmic receptor and/or nuclear acceptor proteins specific for estradiol.

0897 LIVER ENZYMES IN THE ECK FISTULA RAT. I. UREA CYCLE ENZYMES AND TRANSAMINASES. *(E.)*

Colombo, J. P.; Herz, R.; Bircher, J. (Dep. Clin. Pharmacol., Univ. Bern, Switzerland). *Enzyme* 14:353-365, 1972/73.

Male Sprague-Dawley rats were sacrificed at the end of 10, 20, and 30 days after portacaval shunt. Two non-operated control animals were always sacrificed at the same time. The liver was removed immediately, frozen, and then homogenized for the assessment of enzyme activities; the protein content of the liver homogenate was also determined. Blood for ammonia determination was drawn from the orbital venous plexus and ammonia content measured immediately using an ion-exchange resin and the Berthelot color reaction. Three typical responses in the activities of the urea-cycle enzymes were observed: type I, normal or slightly decreased enzyme activity/g liver, but decreased/total liver mass (ornithine carbamyltransferase, argininosuccinate synthetase [rate-limiting step of the urea cycle], arginase, glutamate pyruvate, and oxaloacetate transaminase, glutamate dehydrogenase); type II, increased enzyme activity/g liver, but decreased/total liver mass (carbamylphosphate synthetase); and type III, increased enzyme activity/g liver, but normal/total liver mass (argininosuccinate cleavage enzyme). The findings suggest that shunt-induced liver "atrophy" and consequent reduction in functional-enzyme content represent at least one of the factors contributing to the rise in peripheral blood-ammonia concentration and potentially to the development of features interpreted as "portal-systemic encephalopathy".

0898 EFFECT OF MICROSOMAL ENZYME INDUCERS ON THE LIVER CHANGES PRODUCED BY COMMON BILE-DUCT LIGATURE. *(E.)*

Solymoss, B.; Zsigmond, G. (Dep. Pathol., Univ. Montreal, Quebec, Canada). *Proc. Soc. Exp. Biol. Med.* 147(2):430-433, 1974.

The biochemical and morphological changes in the livers of female ARS/Sprague-Dawley rats were studied following ligation of the common bile duct. Groups of 8 animals each served as untreated controls, as ligated controls, or else were ligated and then received (3 days/week) by gastric intubation, spironolactone (84 mg/kg), pregnenolone-16α-carbonitrile (PCN, 68.7 mg/kg) or phenobarbital (50.8 mg/kg) between the 5th and 39th day of the experiments. At the end of the 39th day, the livers of all ligated animals weighed 2-3 times more than those of untreated controls. Electron microscopic analysis also showed bile duct proliferation and hyperplasia of the smooth endoplasmic reticulum. Microsomal protein content of livers from ligated controls was significantl less (20.84 mg/kg) than that from untreated controls (30.36 mg/g). Microsomal protein content of livers from PCN- or phenobarbital-treated ligated rats was, however, greater (23.29 and 24.40 mg/kg, resp.) than that of the ligated controls. Bile duct ligation resulted in an 8-fold decrease in microsomal cytochrome P-450 content, a 2-fold decrease in NADPH cytochrome C reductase specific activity, and a 3.5-fold decreas in ethylmorphine N-demethylase specific activity. Treatment with PCN, however, resulted in an increased cytochrome P-450 content, restored NADPH cytochrome C reductase activity to normal, and increased ethylmorphine N-demethylation. Spironolactone and phenobarbital produced less pronounced effects. PCN also stimulated hepatic bilirubin-UDP-glucuronyl transferase activity compared to untreated controls. Such activity was decreased in ligated but otherwise untreated rats. These results confirm previous findings in which long-term ligation of the common bile duct produced functional and structural alterations of the hepatic endoplasmic reticulum. Of the microsomal enzyme inducers tested, PCN was the most effective in reversing these changes.

0899 STIMULATION OF THE DEVELOPMENT OF THE HEPATIC EXCRETORY MECHANISM FOR OUABAIN IN NEWBORN RATS WITH MICROSOMAL ENZYME INDUCERS. *(E.)*

Klaassen, C. P. (Univ. Kansas Med. Cent., Kansas City). *J. Pharmacol. Exp. Ther.* 191(2):212-218, 1974.

To determine whether various microsomal inducers would stimulate an early development of the hepatic mechanisms responsible for removal of ouabain from plasma, and its release into the bile, newborn rats (Sprague-Dawley, 1-31 days), were pretreated with these substances for 4 days. The inducers used were phenobarbital sodium (33 or 50 mg/kg), spironolactone (75 mg/kg), pregnenolone-16α-carbonitrile (PCN, 75 mg/kg), or 3-methylcholanthrene (20 mg/kg), each of which was given i.p. in propylene glycol solution. Control rats were given only propylene glycol (5 ml/kg). On the fifth day, 4 mg/kg ^{3}H-labeled ouabain octahydrate was administered i.v. After 15 min a blood sample was taken *via* cardiac puncture. The rats were then sacrificed, and the liver and small intestine removed. The small intestine was homogeni

d assayed for ouabain by means of an Eberbach micro-
apter. Liver samples were counted by liquid scin-
llation spectrometer. To determine the effect of
e inducers on toxicity, rats were injected with them
days 6, 7, 8, and 9, and given ouabain on day 10.
was found that phenobarbital sodium, PNC, and
ironolactone all decreased the plasma ouabain con-
ntration in all age rats. They also decreased the
abain concentration in the livers of rats 25 days
d older, but increased them in younger rats (ap-
oximately 15 days old). The 3-methylcholanthrene
d not decrease plasma concentration, and tended to
crease liver concentration. It did not alter oua-
in toxicity, while the other 3 inducers decreased
significantly in 10 day old rats. It is concluded
at in the newborn rat, some microsomal enzyme in-
cers will increase biliary excretion of ouabain by
hancement of its transfer from plasma to liver. In
ts over 25 days old, the major effect is enhance-
nt of the transfer from hepatocyte to bile.

00 EFFECT OF URIDINE-DIPHOSPHATE-GLUCOSE ON LIVER GLUCURONYL TRANSFERASE ACTIVITY IN
RMAL AND IN FASTING RATS.

(E.) Okolicsanyi, L.;
remin, S. (Univ. Polyclin., Padova, Italy).
zyme 14:366-371, 1972/73.

x Sprague-Dawley rats received 20 mg/kg uridinedi-
osphate glucose (UDPG) in physiological saline
p. 1 hr before taking liver specimens; in a second
oup of 6 rats, 20 mg/kg UDPG was administered for
days i.p.; and in the third group of 6, 50 mg/kg
PG were given for 5 days i.p. Another 6 animals
rved as controls for glucuronyl transferase (GT)
tivity. At the end of the experimental period,
ver specimens were taken under pentobarbitone
esthesia; the GT activity was determined within
hr using 4-nitrophenol as substrate. After UDPG
eatment GT activity increased significantly, but
th 50 mg/kg UDPG the rise of enzyme activity was
ss important than with 20 mg/kg. The 1-hr treat-
nt did not affect GT activity. In another series
experiments, 6 rats were submitted to a 72 hr
st; 6 other animals were also fasted for 72 hr
t were treated for 5 days with 20 mg/kg UDPG (2
ys before beginning the fast and during the 72-hr
sting period). Fasting caused an important de-
ease in GT activity, while enzyme activities did
t change significantly in fasting rats treated
th UDPG. The mechanism through which UDPG exerts
ese effects remains to be established.

01 EVIDENCE FOR AN ACTIVATING-INACTIVATING SYSTEM OF 3-HYDROXY-3-METHYLGLUTARYL-CoA
EDUCTASE IN MOUSE LIVER.

(E.) Berndt, J.; Gaumert,
. (Inst. Biochem., Soc. Radiat. Environ. Res., Munich,
ermany). *Hoppe Seylers Z. Physiol. Chem.* 355(7):905-
10, 1974.

e activity of 3-hydroxy-3-methylglutaryl-CoA reduc-
se, which catalyzes the first step in cholesterol
nthesis, was studied in liver microsomal prepara-
ions from male White mice. Crude liver homogenates
re found to contain an activating-deactivating sys-
m for the enzyme not present in purified microsomal
preparations. Preincubation of microsomal preparations with various subcellular fractions followed by *in vitro* assay of microsomal reductase activity showed that the reductase activating system was present only in the cytoplasmic fraction. The ability of trypsin to destroy this activating system established that it is proteinaceous mature. Assay of microsomal reductase activity in livers from mice following 24-hr starvation or feeding of a high-cholesterol diet, two factors known to decrease reductase activity, showed decreased enzyme activation in both cases. The physiologic significance of these findings remains to be determined.

0902 STUDIES OF SERUM LECITHIN-CHOLESTEROL ACYL TRANSFERASE ACTIVITY IN RAT: EFFECT OF VITAMIN E DEFICIENCY, OXIDIZED DIETARY FAT, OR INTRAVENOUS ADMINISTRATION OF OZONIDES OR HYDROPEROXIDES.

(E.) Takatori, T.; Privett, O. S. (Hormel Inst., Univ. Minn., Austin). *Lipids* 9(12):1018-1023, 1974.

Serum lecithin-cholesterol acyl transferase activity was studied in male Sprague-Dawley rats fed a diet for 9 months depleted of vitamin E or for 10 months containing oxidized fat. In other experiments, the effects of i.v. injected methyl linoleate hydroperoxide and methyl linoleate ozonide (20 mg/100 g) were studied on serum acyl transferase activity. Acyl transferase activity was decreased by vitamin E deficiency from a control value of 778 nM ^{14}C-cholesterol esterified/min/liter to 531 nM/min/liter ($P < 0.02$). Dialuric acid-induced erythrocyte hemolysis was about 30-fold greater in vitamin E deficient than in control rats. Vitamin E deficiency had no effect on serum fatty acid composition, cholesterol, free fatty acid or triglycerides but did significantly elevate serum cholesterol esters from 80.8 (in controls) to 93.6 mg% ($P < 0.05$). Serum acyl transferase activity was significantly increased in rats fed a diet containing 2% oxidized safflower oil (1150 *versus* 785 nM/min/liter) or oxidized menhaden oil (1500 *versus* 651 nM/min/liter). Injection of methyl linoleate hydroperoxide or ozonide caused an immediate 2.5- to 3-fold decrease in acyl transferase activity which returned to normal after 5 hr. Injection of 2-mercaptoethanol, a substance which counteracts sulfhydryl-blocking agents, 5 min after injection of the hydroperoxide or ozonide partially reversed the inhibition. Thus, the inhibitory effect of hydroperoxides and ozonides on lecithin-cholesterol acyl transferase is not entirely due to blocking of sulfhydryl groups of the enzyme. The reduction of enzyme activity in vitamin E deficient rats may be due to some direct alteration by oxidation or to some effect secondary to an alteration in phospholipids.

0903 SELENIUM DEFICIENCY AND PROTEIN, RNA AND DNA SYNTHESIS IN RAT PANCREAS AND LIVER.

(E.) McConnell, K. P.; Hsu, J. M.; Anthony, W. L.; Bieri, J. G. (VA Hosp., Louisville, Ky.). *Proc. Soc. Exp. Biol. Med.* 147(2):575-577, 1974.

Protein, RNA and DNA metabolism were studied in the pancreas and liver of weanling male Sprague-Dawley rats fed a selenium-deficient diet containing vitamin

E (100 mg/kg) for 66 days. Compared to control animals fed a diet supplemented with 0.5 ppm selenium as sodium selenite, selenium-deficient rats had significantly less ($P<0.01$) selenium in the 3 tissues studied (liver, kidney, muscle). Selenium-deficient rats gained less weight (260 gm) than did controls (280 gm). Estimation of the rates of protein, RNA and DNA synthesis by measuring the amount of acid insoluble radioactivity in liver and pancreas following injection of [^{14}C]glycine-2, [^{3}H]uridine-5,6 or [^{3}H]thymidine, showed no significant differences between control and selenium-deficient rats. These results do not lend support for any functional changes in protein, RNA and DNA metabolism in the liver and pancreas of selenium-deficient rats and are not consistent with gross changes in pancreatic enzyme activities as previously reported for selenium-deficient chicks.

0904 IRON DEFICIENCY: IMPAIRED LIVER GROWTH AND DNA SYNTHESIS IN THE RAT. *(E.)* Siimes, M. A.; Dallman, P. R. (Dep. Pediatr., Univ. California, San Francisco). *Br. J. Haematol.* 28(4):453-462, 1974.

The rates of liver growth and DNA synthesis were studied in Sprague-Dawley rats weaned to an iron deficient diet. In the first set of experiments, animals were fed *ad lib* after weaning on day 21 and were sacrificed at various times up to 48 days of age. Decreased liver iron stores and PCV were observed prior to weaning; retarded liver and body weight increase began shortly after weaning. At 48 days of age, the liver iron, PCV, liver weight and body weight were depressed to 89, 64, 36 and 23% below control values, resp. Mean total liver DNA concentration became variably decreased in iron-deficient rats after 33 days of age; however, *in vivo* incorporation of ^{3}H-thymidine into liver DNA and liver thymidine kinase activity were unaffected. Supplementation of the diet of deficient rats with iron dextran for 2 days prior to killing at 48 days increased liver non-heme iron by 601% to values comparable to age-matched controls; PCV increased by 44% and liver and body weights rose 22% and 7%, resp.; no changes occurred in total liver DNA content. In a second set of experiments, rats were given food only twice daily to determine any possible effects of feeding pattern. Total liver DNA and weight gain increased more slowly than in rats fed *ad libitum*. Although ^{3}H-thymidine incorporation was normal over a 24 hr period, incorporation of ^{32}P into liver DNA was decreased in iron-deficient rats. These results indicate that changes in liver DNA synthesis due to iron deficiency occur which are distinct from those seen in starvation and protein-caloric malnutrition.

0905 ALCOHOL, AMINO ACIDS, AND ALBUMIN SYNTHESIS. *(E.)* Rothschild, M. A.; Oratz, M.; Schreiber, S. S. (New York VA Hosp., N.Y.). *Gastroenterology* 67(6):1200-1213, 1974.

The isolated perfused rabbit liver was used to compare the acute effects of alcohol and amino acids on albumin synthesis, polysomal aggregation, and RNA turnover. The perfusion solutions consisted of washed rabbit RBC with a bicarbonate buffer containing 3 g/100 ml rabbit or bovine albumin, 0.08% glucose, test amino acids in a final concentration of 10 mM, and/or alcohol at 220 mg/100 ml. Albumin synthesis was determined isotopically and immunologically and the methods agreed well. [^{3}H]Uridine was added to the perfusion solution to label newly synthesized RNA. Fasting reduced albumin synthesis 50%, and the endoplasmic reticulum-bound polysome was disaggregated. Tryptophan, arginine, ornithine, lysine, phenylalanine, glutamine, alanine, threonine, and proline increased albumin synthesis toward or exceeding the value found in the fed control, and the endoplasmic membrane-bound polysome was reaggregated. Leucine, valine, methionine, and histidine failed to stimulate albumin synthesis or cause reaggregation. The RNA of the bound polysome achieved 60% of the specific activity of that in the free polysome in the fed control preparation, and no change occurred with fasting or after the stimulating amino acids. Total RNA was decreased in fasting and rose after perfusion with the stimulating amino acids. The depression in albumin synthesis, therefore, appears to be related to a decrease in available ribosomes. Alcohol reduced albumin synthesis by 67% and caused marked disaggregation of the endoplasmic membrane-bound polysome. Arginine, trytophan, ornithine, and lysine reversed this depression, and reaggregation with the endoplasmic membrane-bound polysome occurred. Alcohol, however, reduced the bound to free relative specific activity ratio; the addition of stimulating amino acids returned this ratio toward normal. No loss in RNA was noted. Thus, alcohol appears to alter the formation of new polysomes, possibly by impeding the attachment of new labeled ribosomes on to mRNA. The combination of fasting and alcohol, although not reducing albumin synthesis below the level seen with either stress applied alone, prevented the liver from recovery from either stress, in terms of albumin synthesis or polysomal reaggregation.

0906 INCORPORATION OF LABELLED AMINO ACIDS INTO LIVER PROTEIN AFTER ACUTE ETHANOL ADMINISTRATION. *(E.)* Morland, J. (Dep. Pharmacol., Univ. Oslo, Norway). *Biochem. Pharmacol.* 24(3):439-442, 1975.

The effects of acute ethanol administration were studied on incorporation of amino acids into rat hepatic proteins and precursor pools both *in vivo* and using an *in vitro* liver perfusion system. When livers were perfused for 1 to 2.5 hr with solution containing ethanol (0.05-0.30%), incorporation of ^{3}H-valine into protein was unaffected. The proportion of labeled protein remained the same between ethanol-perfused and control livers for at least 1.5 hr after administration of cyclophosphamide, indicating that ethanol also had no effect on protein degradation. The fact that the amount of ^{3}H-valine present in perfused liver 5 min after addition of label was the same for ethanol-treated and controls implied that ethanol had no effect on precursor pool specific activity. Labeled perfusate proteins, however, were reduced from 7.1% to 5.0% of the labeled hepatic proteins after ethanol treatment, suggesting that ethaneither reduced synthesis or release of perfusate oteins. Acute ethanol ingestion (11 g ethanol o./kg/day for 4 days) by previously untreated rats sulted in a 183-189% increase in hepatic free leune and in incorporation of free leucine counts comred to controls, in which sucrose was substituted ocalorically for ethanol in the diet. Incorporaon of ^{3}H-leucine into hepatic proteins was not afcted by ethanol even after corrections were made r differences in leucine precursor pool specific tivity. Acute ethanol administration to rats given hanol for 4 weeks increased free leucine concentraon to 153% and free leucine radioactivity to 263% the control values and caused a 55% reduction in -leucine incorporation into hepatic protein. These sults combined with previously published reports in ich ethanol reduced hepatic uptake of 2 other amino ids suggest that ethanol exerts selective effects the various amino acid membrane transport systems.

07 EFFECT OF ETHANOL ON THE METABOLISM OF ALANINE, GLUTAMIC ACID, AND PROLINE IN RAT VER. *(E.)* Hakkinen, H. M.; Kulonen, E. (Res. Lab. ate Alcohol Monop., Helsinki, Finland). *Biochem. armacol.* 24(2):199-204, 1974.

anine, glutamic acid, and proline metabolism were udied in liver homogenates from male Wistar rats ven ethanol (550 mg/100 g, 60 min) by stomach tube d in normal, rat liver slices incubated in ethanol 0 mM, 2 hr). Net formation of alanine in ethanoleated liver homogenates as determined from electrooretic assay was decreased to 30.8% of control. zymatic determinations showed that synthesis of utamic acid from α-ketoglutaric acid was increased about 33% in both ethanol-treated liver homogenates d slices. The inability of glutamic acid to accumute in normal liver homogenates incubated with hanol *in vitro* indicates that an intact cellular ocess is necessary for this effect. Ethanol also imulated free proline accumulation by 50-60% both liver slices and in homogenates from *in vivo* treated ts at all glutamine concentrations used. The ratio proline to glutamic acid was not, however, changed. dition of lactic acid to the homogenate incubation xture stimulated proline formation from glutamic id by 37-100%. Thus, increased proline availabily to hepatic fibroblasts secondary to ethanol effect y be one mechanism by which connective tissue is tivated in liver to develop alcoholic cirrhosis.

08 CHARACTERISTICS OF ETHANOL AND ACETALDEHYDE OXIDATION ON FLAVIN AND PYRIDINE NUCLEOTIDE UORESCENCE CHANGES IN PERFUSED RAT LIVER. *(E.)* ndros, K. O.; Oshino, N.; Parrilla, R.; Williamson, R. (Johnson Res. Found., Univ. Pennsylvania, Philalphia). *J. Biol. Chem.* 249(24):7956-7963, 1974.

e percentage decomposition of the catalase-H_2O_2 termediate by methanol and ethanol was determined om absorbance changes (660-640 nm) and used to callate the intracellular ethanol concentration in the bes of *in vitro* perfused male albino rat livers. lues obtained were similar to those measured in the fluent fluid from the liver. Using this technique, a value of 0.09 mM for the apparent K_m of alcohol dehydrogenase *in situ* for ethanol and a V_{max} value of 1.25 μM/min/g wet weight of liver were calculated. The hepatic ethanol concentration giving half-maximal reduction of the pyridine nucleotides as determined from pyridine nucleotide fluorescence changes (366-nm excitation, 460-nm emission) was 0.07 mM. When arterial fluid ethanol concentrations were used, the apparent K_m for ethanol was about 0.4 mM. The apparent K_m values for ethanol measured *in situ* are 5- to 20-fold lower than values measured with isolated rat liver alcohol dehydrogenase, indicating that ethanol metabolism by the liver is not directly limited by alcohol dehydrogenase activity but rather by the rate of reoxidation of cytosolic NADH. At the low rates of hydrogen peroxide production observed in substrate-free perfused livers, rates of ethanol oxidation *via* alcohol dehydrogenase calculated from the different effectiveness of ethanol and methanol in decomposing the catalase-H_2O_2 intermediate were similar to rates of ethanol uptake measured directly from arteriovenous concentration differences. Changes of flavin and pyridine nucleotide fluorescence as measured by surface fluorometry were compared with changes in the ratios of lactate to pyruvate and β-hydroxybutyrate to acetoacetate in the effluent fluid perfusing the liver. Titrations with octanoate to reduce the pyridine nucleotides in the mitochondrial compartment showed that the oxidation-reduction state of the fluorescent flavoproteins was in rapid equilibrium with the ratio of β-hydroxybutyrate to acetoacetate. A comparison of pyridine nucleotide oxidation-reduction changes during ethanol infusion, and titrations with acetaldehyde in the absence and presence of 4-methylpyrazole (an inhibitor of alcohol dehydrogenase), showed that at acetaldehyde concentrations above 0.2 to 0.4 mM a dismutation between alcohol and acetaldehyde dehydrogenase occurred in the cytosolic compartment. At lower acetaldehyde concentrations commensurate with those occurring during ethanol oxidation, the evidence indicates that acetaldehyde is normally oxidized in the mitochondrial compartment.

0909 HEPATIC TRYPTOPHAN OXYGENASE ACTIVITY AS A MARKER OF CHANGES IN PROTEIN METABOLISM DURING CHRONIC ETHANOL TREATMENT. *(E.)* Morland, J. (Inst. Pharmacol., Univ. Oslo, Norway). *Acta Pharmacol. Toxicol. (Kbn.)* 35(2):155-168, 1974.

Hepatic tryptophan oxygenase activity was studied in blood samples from male Wistar rats fed a diet containing ethanol (22, 30 or 38% of the total caloric intake). Controls received a diet containing isocaloric amounts of sucrose instead of ethanol. Rats receiving ethanol as 30 and 38% of the calories showed significant reductions in tryptophan oxygenase activity after 7 and 21 days, resp., which lasted for the remainder of the experiment (total of 50 days). Rats receiving ethanol (22%) showed no decrease. Hepatic triglyceride content, plasma lipids, plasma enzyme activities (alkaline phosphatase, SGOT and SGPT) and hepatic histology were only slightly or transiently affected. *In vitro* liver perfusion experiments using organs from rats treated with ethanol for 7 or 21 days showed a 30% reduction in dexamethasone-induced tryptophan oxygenase and a 20% decrease in tyrosine transaminase activity. Incorporation of isotopically-labeled amino acids into perfused livers of ethanol-treated rats (21 days) was reduced by 20% after 1 hr although the specific activity of proteins as well as acid-soluble counts were unchanged. Ethanol treated rats also showed a slight insignificant reduction in liver and plasma proteins. Protein electrophoresis revealed no qualitative changes in ethanol-treated animals. It was thus concluded that tryptophan oxygenase activity is most probably an indicator of the synthesis of this enzyme as well as of other proteins sensitive to chronic ethanol administration.

0910 LIPOPROTEIN LIPASE ACTIVITY OVER ACUTE ALCOHOLIC POISONING. *(E.)* Mitkov, D. (I.P. Pavlov Higher Med. Inst. Plovdiv, Bulgaria). *Folia Med. (Plovdiv)* 15(3):135-140, 1973.

Serum lipoprotein lipase activity was studied in 80 fasted white rats following gastric intubation of a 50% ethanol solution (9.3 gm/kg) and i.v. administration of heparin (50 U/100 gm) 16-18 hr later. Total plasma lipid levels were greatest 16-18 hr after ethanol intubation (610 mg% compared to 354 mg% in controls). Serum lipoprotein lipase activity was also greatest at this time, showing increased activity in response to i.v. heparin administration when compared to heparin-treated controls. Since previous studies have shown free heparin levels to be decreased 16-18 hr after acute ethanol ingestion in rats, these results indicate that acute ethanol ingestion is most probably associated with lowered free plasma heparin which inhibits secretion of lipoprotein lipase into the blood resulting in delayed hydrolysis of triglycerides. Thus ethanol-induced hyperlipemia is most likely of the retention type.

0911 RADIOSCINTIGRAPHIC STUDIES OF ^{11}C DISTRIBUTION IN CATS GIVEN 1-^{11}C-ETHANOL. *(E.)* DeGrazia, J. A.; Rodden, A. F.; Teresi, J. D.; Busick, D. D.; Walz, D. R. (Stanford Univ Sch. Med., Calif.). *J. Nucl. Med.* 16(1):73-76, 1974.

The distribution of ^{11}C-isotope following i.v. injection of ^{11}C-ethanol into 8 cats was studied using gamma-ray scintigraphy. Over 50% of the ^{11}C-isotope was present in the liver and lungs of cats shortly after being given a high specific activity dose. Peripheral tissues equilibrated more slowly. Liver ^{11}C-isotope content was relatively decreased and lung activity was correspondingly increased in animals given a low specific activity ^{11}C-ethanol dose. These changes most likely reflect changes in the rate of hepatic ethanol metabolism. The overall tissue content of ^{11}C-isotope in these studies was directly proportional to the amount of ^{11}C-ethanol administered. Thus, ^{11}C-labeled compounds may possibly be used to obtain useful *in vivo* information by gamma-ray scintigraphy, particularly with respect to the metabolic functions of various organs.

0912 ACUTE ALCOHOLIC FATTY LIVER -- METABOLISM OR STRESS. *(E.)* Kalant, H.; Khanna, J. M.; Seymour, F.; Loth, J. (Dep. Pharmacol., Univ. Toronto, Canada). *Biochem. Pharmacol.* 24(3):431-434, 1974.

Hepatic triglyceride accumulation was studied in male Wistar rats following ethanol administration. Animals which received a single, intoxicating dose of ethanol (4.8 g/kg) by stomach tube had hepatic triglyceride levels (13.68 mg/g liver) which were twice those of the controls (6.71 mg/g) which received a single dose of glucose. When the same total dose of ethanol was given in 4 equally divided, nonintoxicating portions 3 hr apart, hepatic triglycerides were elevated (10.24 mg/g) but not to the extent that they were following the single dose. Peak blood ethanol level following the single dose was 400 mg/180 ml after 2-4 hr and during administration of the divided doses was 122 mg% at 10 hr. The 2 curves, however, were superimposable after the 10th hr, suggesting that the microsomal oxidizing system was not contributing to ethanol disappearance from the blood. The fact that the differences in hepatic triglycerides between the 2 feeding schedules were not seen in animals used the day following arrival to the laboratory was interpreted to indicate that high blood adrenalin due to stress was present in this group. It is concluded that, although ethanol metabolism is primarily responsible for triglyceride buildup, intoxication and the direct effect of ethanol *per se* also contributes significantly.

0913 VIRAL POTENTIATION OF CHEMICAL TOXINS IN THE EXPERIMENTAL SYNDROME OF HYPOGLYCEMIA, ENCEPHALOPATHY, AND VISCERAL FATTY DEGENERATION. *(E.)* Colon, A. R.; Ledesma, F.; Pardo, V.; Sandberg, D. H. (Univ. Miami Sch. Med., Miami, Fla.). *Am. J. Dig. Dis.* 19(12):1091-1101, 1974.

In an attempt to further elucidate the pathogenesis of the syndrome of hypoglycemia, encephalopathy and fatty degeneration of the liver, the effects of various hepatotoxins, including 4-pentenoic acid, aflatoxin B, cuprizone, polychlorinated biphenyl and lindane, with or without concomitant mengo virus infection, were studied on the livers of fed and fasted Sprague-Dawley rats. The most striking and consistent changes were observed in virus-infected rats given 4-pentenoic acid (100 mg/kg/day i.p., i.m. or i.v.). Medullary vacuolization and pericellular clear spaces were common in these animals. Livers demonstrated fine vacuolization and hepatocyte glycogen depletion was confirmed cytochemically. Electron microscopy showed, in addition to those changes already noted, the presence of prominent electron-dense granules within swollen mitochondria. These granules measured from 0.1 to 1.0 µm and showed a finely fibrillar structure. Although their origin is obscure, they were observed only in rats exposed to pentenoic acid and mengo virus. Pentenoic acid treated, mengo virus infected animals were frequently hypoglycemic, and hepatic triglyceride steatosis was marked. The virus-accentuated hepatic steatosis observed in these studies supports the hypothesis that the syndrome of hypoglycemia, encephalopathy and fatty visceral degeneration may result from potentiation of an hepatic mitochondrial toxin by viral infection.

914 FATTY LIVER PRODUCED BY HYPERALIMENTATION
OF RATS. *(E.)* Chang, S.; Silvis, S. E.
V.A. Hosp., Minneapolis, Minn.). *Am. J. Gastro-*
nterol. 62(5):410-418, 1974.

atty liver formation was studied in restrained male
prague-Dawley rats infused with a hypertonic dex-
rose solution, with or without amino acid supplemen-
ation, through a superior vena cava catheter deli-
ering 130 to 341 cal/kg/day. Infusion for 4 days
f hypertonic dextrose at a high caloric level (>300
al/kg/day) resulted in gross fatty infiltration of
he livers of 8 of 9 rats, which was not prevented
y addition of essential amino acids at levels ex-
eeding the minimal daily oral requirement. Addition
f a fibrin hydrolysate showed some sparing effect in
nimals infused at a rate of 250 cal/kg/day but had
o effect in animals receiving 315 cal/kg/day. Total
iver lipid content was measured in 60 rats and was
ignificantly increased in animals infused with 209
al/kg/day. Total hepatic lipid levels, however, had
o predictive value with respect to the degree of fat-
y infiltration. Although all animals infused with
extrose had increased liver glycogen, total levels
ere < 600 mg and accounted for only a small fraction
f liver weight gain which was directly related to
aloric intake (r=0.68). Although some rats were in
egative nitrogen balance, fatty liver was observed
ven in the presence of a positive nitrogen balance.
he induction of fatty liver under these conditions
as thus felt to be primarily a result of high calor-
c intake although possible influences of restraint
nd negative nitrogen balance could not be totally
uled out.

915 STUDIES ON THE PATHOGENESIS OF EXPERIMENTAL
CHRONIC ACTIVE HEPATITIS IN RABBITS: I.
NDUCTION OF THE DISEASE AND PROTECTIVE EFFECT OF
LLOGENEIC LIVER SPECIFIC PROTEINS. *(E.)* Meyer Zum
uschenfelde, K. H.; Hopf, U. (2nd Dep. Intern. Med.,
niv. Mainz, Germany). *Br. J. Exp. Pathol.* 55(5):
98-508, 1974.

he protective effect of allogeneic liver specific
roteins on the development of histologically demon-
trable liver lesions was studied in 65 white New
ealand rabbits which underwent long-term i.p. immuni-
ation for periods from 18 to 143 weeks with human
iver specific proteins (25 mg i.p. each injection)
lus complete Freund's adjuvant. Immunization with
uman protein produced a chronic active hepatitis or
iver cirrhosis in all animals. Autoimmunity as
emonstrated by skin testing was induced by human
iver protein against the human liver antigens and
ersisted following subsequent immunization with rab-
it liver protein (5-25 mg each injection). Combined
dministration of human and rabbit liver protein
native and aggregate-free, resp.) caused histologic-
lly documented liver lesions in only 1 of 8 (13%)
nimals. Skin testing with rabbit liver protein was
egative in 6 and weakly positive in the other 2 rats
fter 14 weeks. The humoral immune reactions in these
nimals were the same as those observed in human liver
rotein immunized rats: a decreasing titer against
abbit liver protein. Rats receiving only complete
reund's adjuvant (1-2 ml each infection) neither
developed positive antibody titers nor developed chronic active hepatitis or liver lesions. The pathogenesis of experimental chronic active hepatitis under these conditions thus appears to be mediated by a cellular rather than humoral toxicity.

0916 HEPARINOIDS -- A NEW INHIBITOR OF EXPERIMENTAL LIVER NECROSIS IN RATS. *(E.)* Bartsokas, S. K.; Papadimitriou, D. G.; Papacharalampous, N. X.; Katapoti, Z.; Kannas, D. (Med. Fac., Athens Univ., Greece). *Acta Hepatogastroenterol. (Stuttg.)* 21(4):253-260, 1974.

To determine whether the heparinoid sodium pentosan polysulfate directly affects thioacetamide-induced liver cell necrosis and whether it induces hypothermia, adult Wistar rats were poisoned by a 2% aqueous solution of thioacetamide (200 mg/kg i.p.). Some groups of rats (32-48/group) were given 10 or 20 mg of the heparinoid immediately after poisoning and 6 hr later, and others were given additional doses 12 and 18 hr later. Controls were either untreated or injected i.p. with distilled water at the same dosages and times as the heparinoids. Rats were sacrificed from 24-96 hr after poisoning. Liver tissues were stained with hematoxylin and eosin and observed by light microscopy. No differences were found between the lesions found in the untreated group and the group given the distilled water. Groups that had been given lower total dosages, either through amount injected or number of injections, showed greater necrosis than those given higher total dosages, including those sacrificed at 72 and 96 hours. No lowering of rectal temperature was found in the treated groups. It is concluded that sodium pentosan polysulfate protects the liver against thioacetamide toxicity by directly preventing liver cell necrosis.

0917 THE EFFECT OF THE HYPOCHOLESTEROLEMIC DRUG CLOFIBRATE ON LIVER MITOCHONDRIAL BIOGENESIS: A ROLE FOR NEUTRAL MITOCHONDRIAL PROTEASES. *(E.)* Gear, A. R. L.; Albert, A. D.; Bednarek, J. M. (Dep. Biochem., Univ. Virginia, Charlottesville). *J. Biol. Chem.* 249(20):6495-6504, 1974.

The action of clofibrate on liver mitochondrial levels was investigated to confirm the hypothesis that the drug's hypolipemic action is correlated with the increased mitochondrial levels. Male albino Sprague-Dawley rats were given the ethyl ester of clofibrate in a concentration of 0.3% (w/w) in their diet. Mitochondria were isolated by differential centrifugation, and the heavy and light fractions combined. Mitochondrial neutral protease was assayed at intervals from 10 to 20 days after initiation of treatment. Clofibrate was found to produce a 100% increase in hepatic mitochondrial content within 10 days. To test whether a change in yield was responsible, total cytochrome c oxidase activity in the nuclear, mitochondrial, and supernatant fractions were assayed and found to be the same in experimental and control animals. At 6 days on clofibrate, there was a significant increase in respiratory control. A decrease in the outer mitochondrial enzymes, such as during massive mitochondrial biogenesis, was noted. However, no significant increases in mitochondrial DNA or RNA were found. No differences between experimental animals and controls were found in half-life studies of the mitochondria, using guanidinio-^{14}C-labeled arginine. However, the synthesis constant was determined by use of ^{35}S-labeled methionine, sacrificing rats after 10, 20, 30, and 60 min. At the shortest times, stimulation of protein synthesis was found. Mitochondrial neutral protease activity was found to be significantly inhibited by monitoring the pattern of phosphate inhibition. The *in vitro* effect of the drug on protease activity was also determined, using an aqueous solution of the sodium salt. No significant inhibition was found. The possibility of lysosomal contamination affecting the *in vivo* results was also eliminated. It is concluded that clofibrate inhibits mitochondrial neutral protease activity and raises the level of newly synthesized protein for incorporation into mitochondria.

0918 BIOCHEMICAL STUDIES ON THE MECHANISM OF ACTION OF LIVER POISONS. III. DEPLETION OF LIVER GLUTATHIONE IN ETHIONINE POISONING. *(E.)* Glaser, G.; Mager, J. (Hadassah Med. Sch., Jerusalem, Israel). *Biochim. Biophys. Acta* 372(1):237-244, 1974.

The mechanism of ethionine poisoning in albino rats was studied with regard to the role of altered glutathione metabolism. Protein synthesis was measured by ^{14}C labeled phenylalanine using a liquid scintillation spectrometer. Oxidized glutathione content was measured by its reduction by glucose-6-phosphate. ATP was determined by the luciferin-luciferase procedure. It was found that in female rats, reduced glutathione liver content and protein synthesizing capacity (measured in cell-free liver preparation) fell rapidly to 40-50% of normal values within 3 hr of ethionine administration. Male and adrenalectomized female rats showed no such decline until after 3 hr. Both sexes showed an equal degree of ATP depletion. It was assumed that the early reduced glutathione decline in the females was due to excessive formation of the oxidized form, which was then immediately destroyed. This was supported by the finding that whole liver homogenates destroyed oxidized glutathione rapidly. There was no difference between normal and ethionine-treated female liver homogenates in capacity to oxidize glutathione, and no difference observed when liver homogenates were fortified with glucose-6-phosphate and NADP. It is suggested that ethionine did not impair the NADPH-linked glutathione reductase. When glucose-6-phosphate was omitted, glutathione reduction was curtailed in treated females, but not males or adrenalectomized females. It is concluded that reduced glutathione depletion by ethionine is not directly related to ATP depletion. It is due to improved glutathione reduction capacity resulting from inadequate substrate for NADPH generation.

0919 BIOCHEMICAL INDICES OF TETRACYCLINE HEPATIC INJURY IN RATS. *(E.)* Shauer, B. A.; Lukacs, L.; Zimmerman, H. J. (VA Hosp., Washington, D.C.). *Proc. Soc. Exp. Biol. Med.* 147(3):868-872, 1974.

Hepatic morphologic and biochemical injury were studi in female Wistar rats following i.p. instillation of tetracycline (100-300 mg/kg). Small droplet fatty infiltration was noted by light microscopy in the liver of all experimental animals by 24 hr after tetracycli administration and reached a maximum extent after 48 hr. These changes were corrected with a 3- to 4-fold increase in SGOT levels after 24 hr compared to controls. A dose of 50 mg/kg produced less than a 2-fold increase in SGOT activity after 24 hr and had no morphologic effect. Changes in SGPT activity were also observed in tetracycline-treated animals (200 mg/kg) but were less sensitive than SGOT levels in reflecting hepatic injury. Serum levels of glutamic dehydrogenase, acid and alkaline phosphatase, β-glucuronidase and bilirubin remained unchanged following tetracycline instillation. The hepatic morphologic and SGOT and SGPT changes following tetracycline administration differed in quality and quantity from those previously observed for nutritional fatty metamorphosis (little or no SGOT and SGPT elevation) and carbon tetrachloride-induced liver necrosis (>100-fold SGOT increase starting within 3 hr).

0920 STUDIES ON THE EFFECTS OF TRICAPRYLIN ON GLUCONEOGENESIS AND KETOGENESIS IN ISOLATED PERFUSED LIVER. *(E.)* Ingebretsen, Jr., W. R.; Wagle S. R. (Indiana Univ. Sch. Med., Indianapolis). *Proc. Soc. Exp. Biol. Med.* 147(2):578-580, 1974.

The effects of gluconeogenic substrates on ketogenesi and the effects of tricaprylin on gluconeogenesis wer studied in perfused livers from 18-24 hr fasted male Cox rats. Addition of 10 mM/galactose, lactate, pyruvate or alanine to the perfusion medium suppressed endogenous ketone body formation by 50-75%. Tricaprylin (1 mM) caused a 20-fold increase in ketogenesis in the absence of carbohydrate. Alanine, pyruvate and galactose had no effect on the increase in ketogenesis in the presence of tricaprylin; lactate, however, reduced the increase in ketone body formation by tricaprylin by about 60%. Lactate had no effect on octanoate-induced stimulation of ketogenesis in this system. Studies conducted on *in vitro* gluconeogenesis showed that tricaprylin stimulated glucose formation by about 2-fold in the presence of 10 mM lactate, alanine or galactose but not pyruvate. Octanoate alone had no effect on glucose production from lactate. It was, however, equally as effective as tricaprylin when the two were present in equimolar quantities, indicating that the increase in glucose synthesis is due to the octanoate moiety of tricaprylin. The rate of ketogenesis did not correlate with the rate of gluconeogenesis under these conditions. These results are in agreement with earlier studies which indicate that fatty acid oxidation is needed for high rates but not for low rates of glucose production. Thus, fatty acid oxidation may regulate gluconeogenesis under conditions of increased availability (eg, hormonal stimulation, starvation or diabetes).

0921 DEPRESSION OF HEPATIC GLUCONEOGENESIS BY ACUTE LEAD ADMINISTRATION. *(E.)* Cornell, R. P.; Filkins, J. P. (Dep. Physiol., Loyola Univ., Maywood, Ill.). *Proc. Soc. Exp. Biol. Med.* 147(2): 371-376, 1974.

The effects of acute i.v. lead administration on hepatic gluconeogenesis were studied in male Holtzman rats. The rats were injected with either lead acetate or sodium acetate (5 mg) and were fasted overnight. Hepatic gluconeogenesis was estimated the following morning following i.v. injection of unlabeled and/or isotopically labeled L-alanine or sodium pyruvate. In addition, gluconeogenesis was similarly assessed in preparations of hepatocytes from lead-injected, fasted rats. Compared to sodium acetate-injected controls, lead acetate-injected rats showed both an insignificant hyperglycemic response following alanine or pyruvate injection and an insignificant rate of incorporation of isotopically labeled substrates into blood glucose. Isolated control hepatocytes synthesized glucose from alanine, lactate, pyruvate, oxaloacetate, glycerol and fructose, whereas hepatocytes from lead-intoxicated rats showed comparable rates of gluconeogenesis only from glycerol. Gluconeogenesis from all substrates requiring obligatory mitochondrial processing was depressed to the greatest extent in lead-treated animals. Incorporation of ^{14}C-alanine into carbon dioxide was also depressed in lead-treated hepatocytes. These results suggest that lead exerts its effects at the level of the mitochondrion and that defects in hepatic glucoregulation may play a role in the toxicity of acute lead poisoning.

0922 A STUDY OF THE RELATIONSHIPS BETWEEN CARBON TETRACHLORIDE-INDUCED LIPID PEROXIDATION AND LIVER DAMAGE IN RATS PRETREATED WITH VITAMIN E. *(E.)* Benedetti, A.; Ferrali, M.; Chieli, E.; Comporti, M. (Inst. Gen. Pathol., Univ. Pisa, Italy). *Chem. Biol. Interact.* 9(2):117-134, 1974.

The relationships between the peroxidation of microsomal lipids and the early liver damage have been investigated in rats pretreated with progressively higher doses of α-tocopherol (vitamin E) and intoxicated with various amounts of carbon tetrachloride. Pretreatment of rats orally with vitamin E at 25 mg/100 g had minor effects on both the peroxidation of microsomal lipids (as measured by diene conjugation) and the liver triglyceride accumulation in rats poisoned with CCl_4 at 250 µl/100 g by gastric intubation. However, a decrease of the peroxidative reaction and of the liver steatosis occurred when the rats were pretreated with progressively higher doses of vitamin E. A close correlation existed between the two phenomena when the intoxication was accomplished with CCl_4 at 250 µl/100 g. Also, the microsomal concentration of α-tocopherol was strictly correlated to both the decrease of microsomal lipoperoxidation and the decrease of liver triglyceride accumulation. The CCl_4-induced impairment of microsomal glucose-6-phosphatase and the incorporation of ^{14}C from $^{14}CCl_4$ into liver microsomal lipids were not affected by vitamin E pretreatment. The extent of microsomal lipoperoxidation was not correlated to the liver triglyceride accumulation when vitamin E-pretreated rats were given CCl_4 at 25 or 2.5 µl/100 g. However, a correlation between lipoperoxidation and liver steatosis occurred when non-pretreated rats were challenged with the three different doses of the halogenated hydrocarbon. Thus, the effect of α-tocopherol in decreasing the extent of microsomal lipid peroxidation in rats given CCl_4 (250 µl/100 g) can be explained by an antioxidant activity *in vivo* against the pro-oxidant effect of CCl_4.

0923 INDUCTION OF GRANULOMATOUS HEPATITIS IN MICE INFECTED WITH GROUP A STREPTOCOCCI AND TREATED WITH PENICILLIN. *(E.)* Spanel, R.; Galle, J.; Heymer, B.; Haferkamp, O.; Schmidt, W. C. (Dept. Pathol., Univ. Ulm, Germany). *Virchows Arch. [Pathol. Anat.]* 363(4):323-332, 1974.

The development of granulomatous hepatitis was studied in 115 inbred CBA/H male and female mice following infection with live group A streptococci (T22/76/2, type 22, 0.5-3.0 mg i.v.) and immediate penicillin G treatment (50,000 U s.c. at 1, 16 and 40 hr). Granulomatous foci which appeared in the livers of infected, treated animals after 8-12 days closely resembled those induced by heat-killed group A streptococci. The only difference between these 2 groups was in the initial phase of induction: in addition to macrophages and lymphocytes, livers of mice injected with live bacteria also contained polymorphonuclear granulocytes. The lesions resembled the entity known as "non-specific granulomatous hepatitis" seen in humans, some of whom had been treated with antibiotics for a recent pyogenic coccal infection. Both the number and size of hepatic granulomas were, in both groups, correlated with the amount of streptococcal particles and antigens in the livers as detected by electron microscopy and immunofluorescence. No other evidence of chronic liver inflammatory disease was seen. The spleen, however, showed a non-specific inflammatory reaction most pronounced between the 4th and 12th day. Mice injected only with live group A streptococci or with penicillin or with latex particles did not develop liver granulomas. There was no evidence that penicillin treatment accelerated elimination of streptococcal components from tissue.

0924 EXPERIMENTAL ACUTE ENCEPHALOPATHY: COMPARISON OF THE ELECTROENCEPHALOGRAPHIC CHANGES IN THE LIVERLESS AND IN THE EVISCERATED RAT. *(E.)* Degos, F.; Degos, J. D.; Bourdiau, D.; Peignoux, M.; Prandi, D.; Roche-Sicot, J.; Sicot, C.; Rueff, B.; Benhamou, J. P. (INSERM, Beaujon Hosp., Clichy, France). *Clin. Sci. Mol. Med.* 47(6):599-608, 1974.

EEG changes in hepatectomized rats were compared with those in eviscerated rats to rule out the possibility that hepatic encephalopathy develops from intestinal release of substances such as ammonia. Male Charles River rats with vena caval ligation and end-to-side portacaval shunts were either hepatectomized (8) or eviscerated (24). In the eviscerated rats both the liver and the other splanchnic viscera were removed. Rats in the sham-operated group (8) were subjected to 20 min laparotomies, and those in the normal group (20) were untreated. Rectal temperatures of both hepatectomized and eviscerated rats and of one group (11) of sham-operated rats were maintained at 26-28 C. In the control rats, 4 states of wakefulness and sleep were found: active wakefulness, quiet wakefulness, slow sleep, and paradoxical sleep. Both normal and refrigerated sham-operated rats were in a continuous state of active or quiet wakefulness with occasional slow sleep EEG patterns. Both the eviscerated and hepatectomized rats showed similar patterns of brain disorders: motionlessness, lack of stimuli response, and intermediate voltage slow waves in the EEG from the first 1-2 1/2 hr; sudden arousal, restlessness and alternating active and quiet wakefulness EEG patterns which slowly changed to motionlessness and slow sleep patterns occurred from 2-11 hr; motionlessness and slow sleep EEG's with deteriorating stimulus responses beginning from 4-13 hr and lasting 5-25 hr. Eventually the EEG tracings became flat and stimulus response was lost. These changes were not related to hypoglycemia, since blood glucose levels were maintained above 6.11 mM/liter; nor were they related to hypothermia, since they were not observed in the refrigerated sham-operated rats. They were also unrelated to low blood pressure. The values for plasma ammonia were significantly lower in the eviscerated rats. The results suggest that encephalopathy induced by hepatectomy and that induced by evisceration are of the same nature, and that the increase in plasma ammonia (or any other neurotoxic substance released from the intestine) has little role in the pathogenesis of hepatic encephalopathy.

0925 METABOLISM OF STEROID AND AMINO ACID MOIETIES OF CONJUGATED BILE ACIDS IN MAN: IV. DESCRIPTION AND VALIDATION OF MULTICOMPARTMENT MODEL. *(E.)* Hoffman, N. E.; Hofmann, A. F. (Mayo Clin., Rochester, Minn.). *Gastroenterology* 67(5):887-897, 1974.

A kinetic multicompartment model has been described for the enterohepatic circulation of conjugated bile acids in man which encompasses bile acid synthesis, amino acid conjugation, bacterial deconjugation, hepatic reconjugation and bacterial dehydroxylation. Mean data from 3 separate groups of healthy subjects were used to assign relative magnitudes to the rate constants. Use of the model to predict the fate of ring labeled bile acids showed good agreement with observed values. The potential errors of the commonly used techniques for estimating bile acid kinetics have been compared and the validity of the Lindstedt method has been confirmed (administration of tracer as free bile acid with specific activity measurements made on combined conjugates of that acid). However, a large error in calculated values for bile acid pool size and input may occur if cholyltaurine is used as tracer and kinetics are calculated only from its specific activity decay curve. The equations necessary to describe biliary bile acid composition for the steroid and the amino acid moiety are also presented, and it is shown that equilibrium composition is the result of hepatic and intestinal events. For both the steroid and amino acid moiety, biliary bile acid composition *per se* gives little information on output rates. This model is applicable to animals other than man with appropriate modifications.

0926 ARE THERE PROLIFERATIVE COMPARTMENTS IN THE GALLBLADDER? *(E.)* Scott, A. J. (Auckland Univ. Sch. Med., New Zealand). *Gastroenterology* 67(6):1231-1237, 1974.

The immediate pattern of nuclear labeling with ^{3}H-thymidine was investigated to determine if proliferative compartments exist in the guinea pig gallbladder. In the first study, 6 guinea pigs were given ^{3}H-thymidine, 0.1 μCi/g i.p. and killed 6 hr later. In the second study, the common bile duct was ligated in 4 guinea pigs 24 hr before they were given ^{3}H-thymidine, 0.1 μCi/g i.p. They were killed 6 hr later. In the normal gallbladder, nuclear labeling was sparse and without detectable relation to any anatomic feature. In the cystic duct, the surface epithelium, the ductules, and the gland acini all showed occasional early labeling. After common duct ligation, label was strongly and uniformly incorporated in cell nuclei in all structures, except the glands of the gallbladder itself. It is concluded that there are no proliferative compartments in the gallbladder of the guinea pig.

0927 TAURINE SYNTHESIS, CONCENTRATION, AND BILE SALT CONJUGATION IN RAT, GUINEA PIG, AND RABBIT. *(E.)* Spaeth, D. G.; Schneider, D. L. (Dep. Nutr. Res., Mead Johnson Res. Cent., Evansville, Indiana). *Proc. Soc. Exp. Biol. Med.* 147(3):855-858, 1974.

The precentage of bile salts conjugated with taurine in bile, as well as taurine concentration and cysteinesulfinic acid and cysteic acid decarboxylase activities were studied in liver, kidney, brain, lung and heart tissues from adult male Wistar rats, guinea-pigs and rabbits. Taurine conjugates constituted 87% of total conjugated bile salts in the rat, 20% in the guinea-pig and 6% in the rabbit. In all 3 species, an overall correlation was observed between the percentage of taurine conjugates and activities of cysteinesulfinic and cysteic acid decarboxylase. The percentage of taurine conjugates was also correlated with the amount of taurine synthesized per g liver but showed no relation to liver taurine concentration. Taurine synthetic capacity for the various tissues was: kidney> brain≥lung>heart with liver capacity being variable. In general, tissue taurine concentration varied inversely with tissue decarboxylase activity. Taurine concentration in all 3 species was 7-fold greater for heart than for any other tissue studied.

0928 GASTRO-INTESTINAL HORMONES AND BILE SECRETION IN THE PERFUSED PIG LIVER: THE EFFECTS OF SECRETIN, CHOLECYSTOKININ AND PENTAGASTRIN. *(E.)* Jablonski, P.; Sali, A.; Watts, J. M. (Prince Henry's Hosp., Melbourne, Australia). *Aust. NZ J. Surg.* 44(2):173-178, 1974.

Perfused livers obtained from pigs (20-30 kg) were infused with solutions of secretin, cholecystokinin and pentagastrin *via* the vena caval line for a period of 90 min. During all experiments, the enterohepatic circulation of bile acids was mimicked by the infusion of 2% sodium taurocholate into the vena caval line at the rate of 11 μM/min. Pentagastrin and cholecystokinin-pancreozymin were dis-

lved in Tis-u-sol infused at rates of 50 µg and
Ivy dog U/hr, resp. Secretin was dissolved in
s-u-sol containing 0.001 M HCl and infused at a
te of 0.75 U/hr. Bile secretion rate was es-
mated by weighing timed bile samples. An increase
the bile secretion rate and bicarbonate output
s found during secretin infusion. Simultaneous
fusion of either cholecystokinin or pentagastrin
th secretin augmented this increase to a level
eater than the sum of the single hormone responses.
cretin produced a fall in bile-salt output, but
ither cholecystokinin nor pentagastrin had any
ch effect. When either cholecystokinin or penta-
strin was infused together with secretin, however,
ere was an increase in bile salt output for 30
n, followed by maintenance of output at base-line
lues. The addition of hormones with the same C-
rminal pentapeptide (pentagastrin and cholecysto-
nin) thus reversed the inhibitory action of secre-
n on hepatic bile-salt excretion. It is concluded
at all 3 hormones influence the handling of bile
lts by the hepatocyte.

29 EFFECT OF CALCITONIN ON THE FORMATION,
COMPOSITION, AND ENZYMATIC ACTIVITY OF THE
PATIC BILE IN GUINEA PIGS. *(E.)* Tarnawski, A.;
gdal, J.; Dura, K.; Marszalek, Z.; Jedrychowski, A.
ed. Acad., Krakow, Poland). *Gut* 15(9):703-705,
74.

n guinea pigs (average weight 343.5 g) were given
lcitonin i.m. in a single dose of 20 MRC U/animal
0.25 ml gelatin diluent. A control group of 10
imals received the gelatin diluent only. The bile
s collected *via* a cannula in the common bile duct
r 180 min after the injection of calcitonin or
luent. After this period, blood was obtained by
rdiac puncture. The animals were killed and speci-
ns of liver tissue excised. The total volume of
le secreted within 180 min was 2.42 ml/100 g for
e controls and 2.54 ml/100 g after calcitonin;
us, calcitonin had practically no effect on bile
ow. It also did not effect bile pH, electrolyte
mposition including calcium, nor the concentration
protein, glucose, cholesterol, nonprotein nitro-
n, and bile acids, nor the activities of alanine
inotransferase and alkaline phosphatase in the
patic bile. Calcitonin decreased the bilirubin
ncentration and increased the activity of gamma
utamyl transpeptidase in the hepatic bile and
creased the calcium content in the liver. The
crease in bilirubin concentration suggests that
lcitonin selectively inhibits the transport of
lirubin into the bile, probably by inhibition of
zymes involved in this transport. The increase
gamma glutamyl transpeptidase activity may be the
sult of induction of this enzyme in the liver or
s enhanced excretion by hepatocytes into the bile
both.

30 BILE ACIDS: XLIV. QUANTITATION OF BILE
ACIDS FROM THE BILE FISTULA RAT GIVEN
^{14}C]CHOLESTEROL. *(E.)* Siegfried, C. M.; Doisy,
., E. A.; Elliott, W. H. (St. Louis Univ. Sch.
l., Mo.). *Biochim. Biophys. Acta* 380(1):66-75,
75.

The bile acids derived from [4-^{14}C]cholesterol administered intracardially to rats with cannulated bile ducts were identified and quantitated. Over a period of 28 days about 90% of the administered ^{14}C was found in bile of which 73% was retained in the biliary acid fraction. [7β-^{3}H]cholic acid, α-muri[3β-^{3}H]cholic acid, β-muri[3β-^{3}H]cholic acid and litho[3β-^{3}H]cholic acid were prepared with specific activities of about 30 µCi/mg by reduction of appropriate ketonic precursors with NaB^{3}H$_4$ and were added to the biliary acid fraction. After separation and purification of the bile acids, cholic, chenodeoxycholic, α- and β-muricholic acids accounted for 70, 16, 7.5 and 6.1%, resp. of the ^{14}C in the biliary acid fraction. The specific activities of these isolated ^{14}C-labeled acids were almost identical. Lithocholic acid accounted for a maximum of 0.2% and ursodeoxycholic acid and 7-oxolithocholic acid could account for no more than 2% of the biliary ^{14}C. Gas-liquid chromatography on 3% OV-17 of the trimethylsilyl ether derivatives of the methyl esters of the common bile acids of rat bile results in their complete separation and provides a convenient means of estimating the relative proportions of these acids in rat bile. By this method, the relative amounts of the four major acids, cholic, chenodeoxycholic, α- and β-muricholic acids were 63, 20, 8 and 6%, resp.

0931 EFFECT OF DIETARY BILE ACIDS, CHOLESTEROL, AND β-SITOSTEROL UPON FORMATION OF COPROSTANOL AND 7-DEHYDROXYLATION OF BILE ACIDS BY RAT. *(E.)* Cohen, B. I.; Raicht, R. F.; Mosbach, E. H. (Pub. Health Res. Inst. City New York, N.Y.). *Lipids* 9(12):1024-1029, 1974.

Male Sprague-Dawley rats were used to study: 1) the effect of feeding bile acids (sodium taurochenodeoxycholate and sodium taurocholate) and sterol (cholesterol and β-sitosterol) upon coprostanol formation; 2) the transformation of β-sitosterol to coprositostanol; and 3) the ratio of primary to secondary bile acids in feces. Animals were fed the experimental diet for 10 days and 2-day samples of feces collected on days 6, 8 and 10 were analyzed by thin-layer and gas-liquid chromatography. On a stock diet rat chow supplemented with 5% corn oil, the rats excreted 14.5 mg/day of total neutral sterol. Coprostanol comprised 35% (5 mg/day) of this fraction. When the diet was supplemented with 0.5% sodium taurochenodeoxycholate, the amount of coprostanol in the feces remained the same as in the controls (3.2 mg/day, 32%). The addition of 0.5% sodium taurocholate to the diet resulted in a 5-fold reduction of coprostanol formation (0.6 mg/day, 8%). When 1.2% cholesterol was added to the stock diet, the amount of coprostanol present in the feces decreased to an average of 11% compared to controls, but the absolute amount formed was greater (35 mg/day). On a diet enriched with 0.8% β-sitosterol, the rats, on the average, converted 24% of the cholesterol to coprostanol. Feeding diets enriched with sodium taurocholate reduced the 7-dehydroxylation of primary bile acids in the feces by 28% and 42%, resp. The conversion of primary bile acids to secondary bile acids in the feces of control, cholesterol, and β-sitosterol fed rats was the same (64%).

These results show that large amounts of dietary sterols and bile acids have different effects on intestinal bacterial degradation of cholesterol, plant sterols and bile acids which may be of significance since previous studies have implicated the interaction of sterols and bile acids with the intestinal wall as an etiologic agent in colon cancer.

0932 INFLUENCE OF SYNTHETIC CONJUGATES OF CHOLIC ACID ON CHOLESTEREMIA IN RATS.

(E.) Story, J. A.; Tepper, S. A.; Kritchevsky, D. (Wistar Inst. Anat. Biol., Philadelphia, Pa.). *J. Nutr.* 104(9): 1185-1188, 1974.

The effects on serum and liver cholesterol levels in male Wistar rats of 2 naturally occurring conjugates of cholic acid (taurocholic and glycocholic acids) and 4 synthetic conjugates (glutamocholic, aspartocholic, cysteocholic and cysteinocholic acids) (0.5% of the diet), in combination with cholesterol (0.5% of the diet) were investigated and hydrolysis of these conjugates by cholylglycine hydrolase was measured. Although cholesterol alone did not cause cholesteremia, combination with cholic acid or with any of its conjugates (except aspartocholate) resulted in significantly higher serum-liver cholesterol pools (15-70%) than in controls. The aspartocholic acid-fed group had serum and liver cholesterol levels significantly lower than the cholic acid:cholesterol-fed animals but similar to those of controls. All conjugates of cholic acid were hydrolized to the same extent (77-87%) by cholylglycine hydrolase except for aspartocholic (36%) and cysteinocholic (42%) acids. There thus appears to be a relation between the ability of a cholic acid conjugate to produce elevated serum and/or liver cholesterol levels in rats and the degree to which it is hydrolized by the intestinal microflora.

0933 MECHANISM OF SECRETION OF BILIARY LIPIDS: I. ROLE OF BILE CANALICULAR AND MICROSOMAL MEMBRANES IN THE SYNTHESIS AND TRANSPORT OF BILIARY LECITHIN AND CHOLESTEROL.

(E.) Gregory, D. H.; Vlahcevic, Z. R.; Schatzki, P.; Swell, L. (VA Hosp., Richmond, Va.). *J. Clin. Invest.* 55(1):105-114, 1975.

The role of bile canalicular and microsomal membranes in the synthesis and transport of biliary lipids was studied in isolated perfused male Wistar rat livers with cannulated common bile ducts. Labeled lecithin precursors ($[^{3}H]$-palmitic acid, $[^{14}C]$linoleic acid, $[^{3}H]$choline, and $^{32}PO_4$) and a cholesterol precursor ($[^{3}H]$mevalonic acid) were administered with and without sodium taurocholate (10 mg/hr). The incorporation pattern of these labeled precursors into linoleyl and arachidonyl lecithins and cholesterol fractions of microsomes, bile canaliculi, and bile were examined at 30-min intervals up to 90 min. Marker enzymes and electron microscopy indicated that isolated subfractions of plasma membranes were enriched with bile canaliculi (<10% microsomal contamination). Taurocholate significantly stimulated the incorporation of $^{32}PO_4$, $[^{3}H]$choline, $[^{3}H]$palmitic acid, and $[^{14}C]$linoleic acid into linoleyl and arachidonyl lecithin with parallel incorporation curves for microsomal and bile canalicular membranes throughout the 90-min study period. During the 30-60-min period, however, these same lecithin fractions in bile significantly exceede the specific activity of the membrane lecithins. The enzyme CDP-choline diglyceride transferase was virtually absent from canaliculi relative to microsomes, indicating that canaliculi lack the capacity for *de novo* lecithin synthesis. Incorporation of $[^{3}H]$mevalonic acid into membranous and biliary cholesterol followed a pattern similar to that for lecithin. The data provide evidence that (1) biliary lecithin and cholesterol are derived from a microsomal subpool regulated by the flux of enterohepatic bile acids, (2) the role of the bile canalicular membranes with respect t biliary lipids is primarily transport rather than synthesis, and (3) lecithin and cholesterol are transported together from microsomes to bile. The finding are consistent with the existence of a cytoplasmic lipid complex within the hepatocyte which is actively involved in the intermembrane transport of biliary lipid.

0934 STIMULATION OF HEPATIC BILE SECRETION BY DOPAMINE.

(E.) Harty, R. F.; Rose, R. C.; Nahrwold, D. L. (Coll. Med., Pennsylvania State Univ., Hershey). *J. Surg. Res.* 17(5):359-363, 1974.

The effect of dopamine on hepatic bile secretion and the influence of propranolol on the biliary response to dopamine was studied in 4 mongrel dogs which had undergone cholecystectomy, monor pancreatic duct ligation, and placement of Thomas cannulas in the most dependent portion of the stomach and in the duodenum opposite the opening of the common bile duct. Two hr after the start of sodium taurocholate infusion (20 μM/min), one of the following was added and was administered for 2.5 hr: dopamine HCl, 20 μg/kg min; propranolol HCl, 3.3 μg/kg min after an initial loading dose of 250 μg/kg; dopamine plus propranolol in the above dosages; or dopamine (20 μg/kg min) plus propranolol, 6.6 μg/kg min after an initial loading dose of 500 μg/kg. Each of these 4 experiments was performed 3 times on each dog in random order. Bile was collected throughout each experiment and separated into 15-min samples. Dopamine significantly increased bile flow rate from a mean control value of 2.9 ml/15 min to a mean peak value of 4.4 ml/15 min within 60 min after the dopamine infusion was begun. Mean bicarbonate concentration increased from 14.8 mEq/liter to 36.2 mEq/liter, mean bicarbonate output from 45 μEq/15 min to 160 μEq/15 min, chloride concentration from 68.5 mEq/liter to 79.8 mEq/liter, and chloride output from 209 μEq/15 min to 342 μEq/15 min. Dopamine had no effect on bile salt output. Propranolol had no effect on bile flow rate, bicarbonate concentration, bicarbonate output, chloride concentration, or chloride output. When propranolol was administered simultaneously with dopamine it prevented the increase in bile flow observed with dopamine alone but did not prevent the increase in bicarbonate output. It is postulated that dopamine, through its action on adenyl cyclase and cyclic AMP, mediates the release of gastrointestinal hormones or acts as a local gastrointestinal hormone.

35 BILIARY EXCRETION KINETICS OF PHENOLPHTHALEIN GLUCURONIDE AFTER INTRAVENOUS D RETROGRADE BILIARY ADMINISTRATION.

(E.)
stafson, J. H.; Benet, L. Z. (Sch. Pharm., Univ.
lifornia, San Francisco). *J. Pharm. Pharmacol.*
(12):937-944, 1974.

liary reabsorption phenomena were examined for
enolphthalein glucuronide in male Sprague-Dawley
ts by measuring biliary and plasma concentrations
ter i.v. and retrograde biliary administration.
ses of 10-20 mg/kg (20-40 nM/kg) of phenolph-
alein glucuronide were administered to 14 rats
v. and to 12 rats *via* the biliary route. In
th cases, 8-10 blood samples (0.4 ml) were with-
awn at selected times up to 20 min after adminis-
ation of the drug. These were immediately cen-
ifuged and aliquots of plasma withdrawn from the
pernatant for assay. Total bile was collected
selected times for up to 3 hr after administra-
on of the drug. A spectrophotometric method,
pable of measuring phenolphthalein glucuronide
amounts as small as 4 nM/100 µl of plasma, was
veloped. There was a significant concentration
phenolphthalein glucuronide in the systemic
ood after glucuronide administration by either
ute and the kinetics of elimination of glucuro-
de were similar. The plasma availability of
liary infused doses was over 45% of the availa-
lity from the i.v. doses based on area under the
rve calculations for the average plasma level-time
rves. The results demonstrate the need to sample
e plasma as well as the bile before any conclusion
n be drawn about reabsorption of a compound from
e biliary ducts.

36 EFFECT OF MICROSOMAL ENZYME INDUCERS ON THE BILIARY EXCRETION OF CARDIAC GLYCOSIDES.

.) Klaassen, C. D. (Univ. Kansas Med. Cent., Kan-
s). *J. Pharmacol. Exp. Ther.* 191(2):201-211, 1974.

e abilities of 4 microsomal enzyme inducers to de-
ease toxicity and enhance excretion of digitoxin,
goxin or ouabain were compared. Male Sprague-Dawley
ts were injected i.p. daily for 4 days with (50
/kg) phenobarbital, pregnenolone-16α-carbonitrile
CN, 75 mg/kg), spironolactone (75 mg/kg), or 3-meth-
cholanthrene (20 mg/kg) and then given digitoxin
.5 mg/kg), digoxin (7 mg/kg) or ouabain (5 mg/kg)
v. The enzyme inducers were made up in propylene
ycol to deliver the dosages in a volume of 5 ml/kg.
e controls were injected with plain propylene glycol.
l microsomal enzyme inducers (especially 3-methyl-
olanthrene) significantly decreased the time between
ss and return of the righting reflex after i.v. in-
ction of zoxazolamine solution (4 ml/kg). PCN de-
eased the toxicity of digitoxin the greatest as
own by increasing its LD_{50} from 7.4 to 15.8; that
digitoxin and ouabain were increased from 23 to 29
d from 16.1 to 20.1, resp. Spironolactone increased
e LD_{50} of digitoxin to 11.5, that of digitoxin to 31
d that of ouabain to 18.5. Phenobarbital increased
e LD_{50} of ouabain to 20.1, and had no effect on the
her 2 glycosides. 3-Methylcholanthrene lowered the
$_{50}$ of ouabain slightly and had no effect on the other
. The plasma disappearance of digitoxin was greatly enhanced by spironolactone and PCN as shown by a 1/3 and 1/6 decrease, resp., in the plasma concentrations. Both also increased biliary excretion of digitoxin 5 and 10 times, resp., that of controls. Similar effects were observed with digitoxin for these 2 enzyme inducers, but slightly lesser effects with ouabain. Phenobarbital increased the plasma disappearance and biliary excretion only of ouabain; 3-methylcholanthrene, in contrast, was near or below control values for all 3 glycosides. These results show there is a marked difference among enzyme inducers in their abilities to decrease toxicity and enhance plasma concentration and biliary excretion of cardiac glycosides. Also, the results support the hypothesis that the enzyme inducers protect by inducing biliary excretion rather than by simply transforming the glycosides to more polar metabolites.

0937 REDUCED RESPONSE TO PHENOBARBITAL BY THE LIVER OF RATS FED A CHOLINE-DEFICIENT DIET.

(E.) Saito, R.; Estes, L. W.; Lombardi, B. (VA Hosp., Pittsburgh, Pa.). *Biochim. Biophys. Acta* 381(1):185-194, 1975.

The effects of choline deprivation on liver function and lipid content following phenobarbital stimulation were studied in male Sprague-Dawley rats. Groups of 4 rats were fed a normal laboratory chow diet, a semipurified choline-supplemented diet, or a semipurified choline deficient diet for 5 days. Phenobarbital was also injected i.p. daily for 5 days and liver protein, lipid and cytochrome P-450 content as well as aminopyrine and ethylmorphine demethylase activities were determined. Phenobarbital-treated rats maintained on the choline-supplemented diet showed no differences from those fed normal chow with respect to content of cellular constituents and demethylase activities. The normal phenobarbital response was, however, reduced in the livers of rats fed a choline-deficient diet. There was less accumulation of smooth endoplasmic reticulum membranes as determined by electron microscopy as well as decreased levels of cellular triglycerides, cholesterol esters, lecithins, proteins, glycogen and total phospholipids. Cytochrome P-450 and demethylase activities were only 36-58% those of control or choline-supplemented rats. It thus appears that dietary choline plus adequate lecithin synthesis are necessary for induction of hepatic microsomal mixed-function oxidases and the concomitant accumulation of smooth endoplasmic reticulum in liver cells.

0938 COMPARISON OF TWO TYPES OF INTRAHEPATIC JAUNDICE IN RATS WITH BILE DUCT LIGATION.

(E.) Czygan, P.; Greim, H.; Hutterer, F.; Schaffner, F.; Popper, H. (Mt. Sinai Sch. Med., City Univ. New York, N.Y.). *Acta Hepatogastroenterol. (Stuttg.)* 21(5):339-345, 1974.

The effects of intrahepatic cholestasis induced by norethandrolone, α-naphthylisothiocyanate (ANIT) and by bile duct ligation on hepatic bile acids, microsomal enzymes, microsomal protein and hepatic ultrastructure were compared in male Sprague-Dawley rats.

Compared to a control serum bilirubin of 0.1 mg%, norethandrolone (100 mg/kg i.p. for 3 days) caused an increase to a non-icteric level of 0.7 mg%; serum bilirubin 48 hr after a single ANIT administration (200 mg/kg p.o.) was 9.9 mg% and those 24, 48 and 72 hr after bile duct ligation were 3.4, 8.1 and 8.3 mg%, resp., all icteric levels. Bile duct ligation resulted in disappearance of secondary deoxycholic and hyodeoxycholic acids after the 1st day, a 3-fold increase in chenodeoxycholic acid by the 2nd day, a 2-fold increase in cholic acid by the 3rd day, and 10-20-fold increases in ursodeoxycholic and β-muricholic acids by the 3rd day. Norethanodrolone induced changes which qualitatively resembled those induced by ligation, with 2-fold increases in cholic and chenodeoxycholic acids, a 4-fold increase in β-muricholic acid and no change in deoxycholic acid. By contrast, ANIT produced a 10-fold increase in β-muricholic acid with disappearance of all hydroxybile acids. Cytochrome P-450 content, aminopyrine demethylase and aniline hydroxylase were decreased in all 3 systems. Morphologic changes induced by norethandrolone and bile duct ligation were similar although less severe in the former; centrilobular bile canalicular dilatation, edematous microvilli, Golgi dilatation and curled mitochondrial cristae. By contrast, ANIT produced peripheral bile canicular dilatation, bleb formation on the sinusoidal and canalicular surfaces of hepatocytes and on the luminal surface of bile duct cells, breaks in the outer mitochondrial membranes, and smooth endoplasmic reticulum hypertrophy. It thus appears that there are at least 2 mechanisms by which intrahepatic jaundice may be induced in rats.

0939 THE ARTERIALIZATION OF THE LIVER IN CHOLOSTATIC [SIC!] CIRRHOSIS AND ITS EVOLUTION.

(E.) Papadimitriou, T. (no affil.). *Clin. Eur.* 12(5):467-475, 1974.

Changes in the hepatic arteries occurring in cholestatic cirrhosis were studied by arteriography and histology of post-sacrifice specimens from dogs. Experimental groups consisted of: 1) 6 dogs with their common bile ducts ligated for 30-75 days, and 2) 9 dogs in which the occlusion was maintained for 45-60 days then released for an additional 60-90 days. Another group of 10 dogs served as controls. After 30 days of occlusion, histologic sections showed: increased periportal connective tissue, occasional leukocytic infiltration, widening and hyperemia of the vessels and inspissated bile within bile capillaries and hepatic cells. Cirrhosis and interlobular connective tissue were present after 45 days. After 75 days of obstruction, cirrhosis, marked hyperplasia of interlobar connective tissue, pseudolobules and hepatic cell degeneration were noted. Arteriograms showed an initial increase in the number and width of hepatic arteries and their tributaries with decreased artery caliber and inability to visualize them past the 3rd subdivision in stages of advanced cirrhosis. Hepatic arteriograms and histologic sections of animals in whom the biliary obstruction had been released for 60-90 days showed similar changes including widening of the arterial network in early cases and narrowing in advanced cases of cirrhosis. These results show that the hepatic changes caused by prolonged cholestasis in dogs do not regress, but actually may progress, following release of obstruction.

0940 THE ENSUING CHANGES OF THE HEPATIC VESSELS AND THE HEPATIC PARENCHYMA FOLLOWING COMPLETE EXTRA-HEPATIC OCCLUSION OF THE BILIARY TREE AND THEIR EVOLUTION AFTER THE RELEASE OF THE CHOLESTASIS (EXPERIMENTAL STUDY).

(E.) Papadimitriou, T. (no affil.). *Clin. Eur.* 12(5):476-490, 1974.

The effects of cholestasis on the changes in hepatic vessels and parenchyma were studied by angiography and histology in 2 groups: 1) 16 dogs whose common bile ducts were ligated for 30-75 days and 2) 9 dogs obstructed for 45-60 days followed by release of the obstruction for 60-90 days. Another group of 10 dogs served as controls. Arteriography revealed progressive widening and increased tortuosity of the hepatic arterial branches which were visible to the liver border after 75 days. Portal venography showed narrowing, increased tortuosity, premature interruptions and porto-portal communications after 75 days. Hepatic venograms showed similar changes with porto-venous communications. Cholangiograms revealed marked biliary distention with increased tortuosity and number of tributaries. Release of biliary obstruction did not prevent progression to hepatic cirrhosis; all animals developed blood-stained ascitic fluid in their peritoneal cavities. Hepatitic changes and fatty liver degeneration were common. Arteriograms, portal and hepatic venograms and cholangiograms showed changes similar to those seen in animals with occluded bile ducts.

0941 HAEMOLYSIS IN EXPERIMENTAL CHOLESTASIS: POSSIBLE ROLE OF ERYTHROCYTE SIALIC ACID.

(E.) Powell, L. W.; LaMont, J. T.; Isselbacher, K. J. (Massachusetts Gen. Hosp., Boston). *Gut* 15 (10):794-798, 1974.

The relationship between hemolysis, erythrocyte cell membrane neuraminic (sialic) acid content and hepatic neuraminidase activity was studied in adult male Fischer rats with cholestatic jaundice induced by ligation of the common bile duct. The extent of release of neuraminic acid *in vitro* from normal rat erythrocytes was directly proportional to the amount of *Vibrio cholerae* neuraminidase added (up to 50 U/ml). The enzyme had no significant proteolytic effect on the cell membrane, and no significant qualitative differences between the major cellular protein bands was seen between control and enzyme-treated cells. *In vivo* ^{51}Cr-labeled erythrocyte survival as determined in unligated rats was inversely related to the neuraminidase concentration used to pretreat *in vitro* and also to the amount of neuraminic acid released during this treatment. Splenic sequestration of neuraminidase-pretreated erythrocytes was also significantly enhanced in unligated rats. The degree of hemolysis noted above was comparable to that previously found after 12 days in bile duct ligated rats. Common bile duct ligation in the present experiments resulted in a significant increase in hepatic neuraminidase activity as well as a decrease in erythrocyte neuraminic acid content. These results are consistent with the hypothesis that one or more neuraminidases present in increased amounts in bile duct-ligated livers cause removal of neuraminic acid from circulating erythrocytes resulting in splenic sequestration of these cells.

0942 ROLE OF THE MALATE-ASPARTATE SHUTTLE IN THE METABOLISM OF ETHANOL IN VIVO. *(E.)* Nordmann, R.; Petit, M. A.; Nordmann, J. (INSERM, Paris, France). *Biochem. Pharmacol.* 24(1):139-143, 1974.

The role of the malate-aspartate shuttle pathway in ethanol oxidation was studied in female Sprague-Dawley rats. Animals received 4 i.p. injections of aminooxyacetate (0.275 mM/kg) at 45 min intervals with a single i.p. injection of ethanol (10 mM/kg) 10 min after the first aminooxyacetate dose. Liver specimens taken under anesthesia 30 min after ethanol injection were analyzed for metabolites; the rate of disappearance of ethanol from the blood was also determined. Compared to saline-injected controls, the rate of ethanol elimination from blood was decreased by 50% in aminooxyacetate-treated animals. Under these conditions, liver aspartate aminotransferase activity was reduced by 90% during the first hr, decreasing to 60% during the following 2 hr. Aminooxyacetate alone produced a 5-fold increase in the hepatic lactate:pyruvate ratio and a 58% decrease in the β-hydroxybutyrate:acetoacetate ratio. Ethanol alone resulted in a 3-fold increase in the lactate:pyruvate ratio but had no effect on the β-hydroxybutyrate:acetoacetate ratio. Combined administration of aminooxyacetate and ethanol enhanced the aminooxyacetate-induced reduced state of the extramitochondrial space (lacate:pyruvate = 10) but did not significantly alter the intramitochondrial oxidized state induced by aminooxyacetate alone. Hepatic α-glycerophosphate levels were enhanced by both aminooxyacetate alone and ethanol alone whereas aminooxyacetate produced a 70% decrease and ethanol a 35% increase in hepatic aspartate. These data show that the malate-aspartate shuttle is inhibited by aminooxyacetate, thus promoting ethanol-induced disturbances of the cytosol redox state; further, the data provide evidence for the *in vivo* involvement of the malate-aspartate shuttle as a rate limiting factor in the transport of reducing equivalents resulting from ethanol oxidation in liver.

0943 ETHANOL-INDUCED CHANGES IN METHIONINE METABOLISM IN RAT LIVER. *(E.)* Finkelstein, J. D.; Cello, J. P.; Kyle, W. E. (VA Hosp., Washington, D.C.). *Biochem. Biophys. Res. Commun.* 61(2):525-531, 1974.

The effect of ethanol (4.4 gm/kg/day p.o.) on methionine metabolism in the livers of male Sprague-Dawley rats fed a protein-restricted diet was studied. Ethanol administration for 3-10 days had little effect on the activities of liver s-adenosylmethionine synthetase, s-adenosylhomocysteine synthetase, 5-methyltetrahydrofolate-homocysteine methyltransferase, betaine-homocysteine methyltransferase, cystathione synthetase and cystathionase of animals fed a diet containing 26% or 55% casein (except for a 50% increase in s-adenosylmethionine synthetase in the 26% casein group). However, 5-methyltetrahydrofolate-homocysteine methyltransferase activity was decreased by 20-40%, s-adenosylmethionine synthetase, betaine methyltransferase, and cystathione synthetase activities were increased by 40-170%, and s-adenosylhomocysteine synthetase and cystathionase acitvities were unchanged in livers of rats fed a low (3.5%) casein diet. Alcohol-treated rats gained weight at the same rate as controls fed a similar diet with isocaloric substitution of sucrose for ethanol. Enzyme activities in brain or kidney were unaffected by ethanol. These changes represent a reversal of the normal adaptive response to protein restriction. The resulting impairment in methionine metabolism could explain the ethanol-induced increase in the dietary lipotrope requirement previously observed.

0944 LONG TERM CELL CULTURE OF RAT LIVER EPITHELIAL CELLS RETAINING SOME HEPATIC FUNCTIONS. *(E.)* Chessebeuf, M.; Olsson, A.; Bournot, P.; Desgres, J.; Guiguet, M.; Maume, G.; Maume, B. F.; Perissel, B.; Padieu, P. (Group Biochem. Cell. Differ., Univ. Dijon, France). *Biochimie* 56(10):1365-1379, 1974.

0945 VIABILITY OF THE ISOLATED LIVER AFTER ITS CLINICAL UTILIZATION: EXPERIMENTAL STUDY OF VARIOUS PRESERVATION TECHNIQUES. *(Sp.)* de Miguel, E.; Goiti, J. J.; Fresneda, V.; Castillo-Olivares Gosalvez, J. L. (Puerta de Hierro Clin., Madrid, Spain). *Rev. Esp. Enferm. Apar. Dig.* 44(4):325-342, 1974.

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1090 ACTION OF THE CHRONIC IRRITATION OF THE SECTION OF THE VAGO-SYMPATHETIC NERVES UPON THE CHOLEDOCHAL SPHINCTER IN THE DOGS. *(E.)* Sarles, J. C.; Devaux, M. A.; N'Guyen, R.; Michel, G. (Dig. Pathol. Res. Unit, INSERM, Marseille, France). *Eur. Surg. Res.* 6(Suppl. 1):55-56, 1974.

1091 INDEPENDENCE FROM VAGAL CONTROL OF BILIARY SECRETION IN THE RAT. *(E.)* Debray, C.; de la Tour, J.; Roze, C.; Souchard, M.; Vaille, C. (Bichat Hosp., Paris, France). *Digestion* 10(6):413-422, 1974.

1092 ANGIOGRAPHIC STUDIES IN EXPERIMENTAL TOTAL AND LOBAR CHOLESTASIS IN DOGS. *(E.)* Bergan, A.; Enge, I.; Hall, C. (Inst. Surg. Res., Oslo, Norway). *Invest. Radiol.* 9(6):462-472, 1974.

1093 EXPERIMENTAL STUDIES FOR LITHOTRIPSY IN THE COMMON BILE DUCT. *(E.)* Deyhle, P.; Schauwecker, H.; Sauberli, H.; Largiader, F. (Surg. Canton. Hosp., Zurich, Switzerland). *Eur. Surg. Res.* 6(Suppl. 1):57, 1974.

1094 ABNORMAL LOW DENSITY LIPOPROTEIN IN PLASMA OF RAT WITH BILIARY OBSTRUCTION. A CHEMICAL AND MORPHOLOGICAL STUDY. *(E.)* Calandra, S.; Pasquali-Ronchetti, I.; Montaguti, M.; Cambi, M.; Caccone, P. (Inst. Gen. Pathol., Univ. Modena, Italy). *Digestion* 10(4/5):340, 1974.

1095 COMPLETE EXTRAHEPATIC OBSTRUCTIVE JAUNDICE--EXPERIMENTS ON DOGS. PART II. CHANGES IN BLOOD CLOTTING. *(Ger.)* Naber, K.; Muller, K.; Maroske, D.; Bichler, K.H.; Hupe, K.; Hoege, R. (Surg. Clin., Univ. Marburg/Lahn, Germany). *Bruns Beitr. Klin. Chir.* 221(1):55-69, 1974.

1096 EFFECTS OF CHOLERA TOXIN, GLUCAGON AND DIBUTYRYL CYCLIC AMP ON BILE FLOW AND BILE COMPOSITION. *(E.)* Baker, A. L.; Tse-Tu, D.; Kaplan, M. M. (Tufts-New England Med. Cent., Boston, Mass.). *Gastroenterology* 67(4):779, 1974.

1097 EFFECT OF BERBERINE ON BILE SECRETION. *(E.)* Oshiba, S.; Ueno, H.; Mihara, H.; Okamoto, S. (Nihon Univ. Sch. Med., Tokyo, Japan). *Nihon Univ. J. Med.* 16(1):69-79, 1974.

1098 THE BILIARY SECRETION OF RADIOACTIVE SELENIUM AFTER INTRAVENOUS INJECTION OF ^{75}Se-L-SELENO-METHIONINE. *(E.)* Pointner, H. (1st Dep. Med., Univ. Vienna, Austria). *Acta Hepatogastroenterol. (Stuttg.)* 21(5):380-382, 1974.

1099 EVIDENCE FOR A DOSE-DEPENDENT STIMULATION OR INHIBITION OF BILE FLOW BY CONTRAST MEDIA. *(E.)* Klapdor, R. (Med. Clin. I, Univ. Hamburg, Germany). *Digestion* 10(4/5):358-359, 1974.

1100 PHENOBARBITAL AND BILIARY EXCRETION OF CONTRAST MEDIA. *(E.)* Klapdor, R.; Valerius, H. (Med. Clin. I, Univ. Hamburg, Germany). *Digestion* 10(4/5):359, 1974.

1101 BILE SECRETION AND LIVER BLOOD FLOW DURING SECRETION INFUSION. *(E.)* Brunner, H.; Slat, B.; Kretschmer, G.; Funovics, J.; Grabner, G. (Surg. Clin. I, Univ. Vienna, Austria). *Digestion* 10(4/5):338-339, 1974.

1102 CONTRASTING EFFECTS OF DIFFERENT TYPES OF ENZYME INDUCERS OF CHOLESTEROL SATURATION OF RAT BILE. *(E.)* von Bergmann, K.; Schwarz, H. P.; Paumgartner, G. (Dep. Clin. Pharmacol., Univ. Bern, Switzerland). *Digestion* 10(4/5):317, 1974.

See also, 0811, 0819, 0820, 0825, 0837, 1118, 1122, 1126, 1320, 1376, 1461, 1592.

SECRETION AND METABOLISM

Intestine

1103 CANINE INTESTINAL SECRETION DURING AND AFTER RAPID DISTENTION OF THE SMALL BOWEL. *(E.)* Caren, J. F.; Meyer, J. H.; Grossman, M. I. (VA Cent., Los Angeles, Calif.). *Am. J. Physiol.* 227(1):183-188, 1974.

Intestinal secretion during and after rapid distention of the small bowel was measured in 4 mongrel dogs with extrinsically denervated Thiry-Vella loops of jejunum and ileum. Tactile stimulation of the mucosa by a condom deflated or slightly inflated (up to 15 ml) for 45 min significantly increased secretion during contact and for 30 min thereafter. This response was abolished by parenteral injections of atropine and hexamethonium although these drugs had no effect on intraluminal pressure. There was no increase in secretion during distention with 20 or 30 ml, but rises in fluid output were sustained for 2 or more hours after distention. This response was reduced by hexamethonium, but not atropine. Leakage of plasma protein, measured as the clearance of plasma-protein bound ^{51}Cr (injected i.v. at least 36 hr prior to distention) accounted for only 12% of secretions before, during, and after distention. Distention of ileum did not cause increased secretion in the jejunum, suggesting that a hormonal mechanism is not involved. Neither the mechanisms of the 2 patterns of secretory response nor the application to small-bowel obstruction can be deduced from this experiment.

1104 EFFECT OF VILLUS LENGTH ON CELL PROLIFERATION AND MIGRATION IN SMALL INTESTINAL EPITHELIUM. *(E.)* Rijke, R. P. C.; van der Meer-Fieggen, W.; Galjaard, H. (Med. Fac., Erasmus Univ., Rotterdam, Netherlands). *Cell Tissue Kinet.* 7(6): 577-586, 1974.

The life span and migration rate of epithelial cells on villi of experimentally reduced length in male Glaxo-Wistar rats was studied. Autoradiographic studies and scintillation counting were made at different time intervals after ^{3}H-thymidine labeling. The labeling was done at 36, 48, and 60 hr intervals after exposure to 700 r whole-body x-irradiation. The results of this study showed that the life span of epithelial cells in rat small intestine (36-48 hr) is independent of the villus length. In villi of reduced length the migration rate of the epithelial cells was decreased when compared to controls. Changes in the migration rate in turn seemed dependent on the production of epithelial cells in the crypt. Comparative studies on the recovery of crypt and villus epithelium after various doses (300 and 700 r) of x-irradiation support the theory that increased proliferative activity in the crypt cell compartment is related to a reduction of the number of functional villus cells below a critical villus length. The findings of this study are important in the interpretation of data on microbiochemical analyses of certain cell differentiation characteristics during periods of increased proliferative activity.

1105 ENZYME CHANGES IN HUMAN SMALL BOWEL MUCOSA DURING CULTURE IN VITRO. *(E.)* Mitchell, J. D.; Mitchell, J.; Peters, T. J. (R. Postgrad. Med. Sch. London, England). *Gut* 15(10):805-811, 1974.

Fluorimetric microassay methods were adapted to investigate enzyme activities in cultures of human jejunal biopsy tissue, and to develop a reproducible, quantitative means of assessing subcellular changes in intestinal mucosal tissue. Human jejunal biopsy slices from 5 normal adult volunteers (27-33 yr) and from one 22-yr-old male with Crohn's disease were maintained in culture (Eagle's basal medium) for up to 48 hr. At 24 hr there was good morphological preservation but by 48 hr there was ultrastructural evidence of damage to the enterocytes. During culture the tissue lost a certain amount of protein and the levels of 3 brush border enzymes (alkaline phosphatase, α-glucosidase, and leucyl-β-naphthylamidase) and 1 lysosomal enzyme (N-acetyl-β-glucosaminidase) showed a progressive decrease as determined by fluorimetric methods. Alkaline phosphatase, α-glucosidase, and N-acetyl-β-glucosaminidase accumulated in the medium throughout the experimental period to give a medium:tissue distribution ratio of between 2 and 9. Leucyl-β-naphthylamidase had a medium:tissue ratio of 140 after 48 hr of culture suggesting a selective secretion of this enzyme by the tissue. The reproducibility of the enzyme assays obtained indicates that detailed enzyme studies on pathological tissue can be undertaken.

1106 THE HYDROLYSIS OF PTEROYLPOLYGLUTAMATES IN THE SMALL INTESTINE. *(E.)* Jagerstad, M;

Westesson, A. K. (Res. Lab. Clin. Hematol., Univ. Lund, Sweden). *Scand. J. Gastroenterol.* 9(7):639-643, 1974.

Hydrolysis of synthetic pteroyloligoglutamates in the stomach and small intestine of male Wistar rats was studied by bioassay with *Lactobacillus casei* and *Streptococcus faecalis*. The rats were intubated with 0.1 μM of a preparation of synthetic pteroylglutamates containing either 1, 3, 4, or 5 glutamyl residues. After 30, 60, 90, and 120 min, the animals were anesthetized with ether, the stomach and small intestine removed and the small intestine divided into 3 parts. The contents from each intestinal part and the stomach were emptied, the folates extracted and the proteins precipitated. Folic acid concentrations assayed with both microorganisms were identical throughout the gastrointestinal tract. The pteroylpolyglutamates were partly hydrolyzed in the stomach and in the intestine up to the pancreatic duct. Thereafter the pteroylpolyglutamates occurred mainly in mono- and/or diglutamic form, as judged by the identical folate concentrations determined with *S. faecalis* and *L. casei*. Pteroylpolyglutamate hydrolase activity was found throughout the entire small intestine with the highest activity in the duodenum, jejunum and ileum; activity was also found in the area between the stomach and the pancreatic duct. No pteroylpolyglutamate-hydrolyzing activity was found in the stomach. It is suggested, therefore, that pteroylpolyglutamate hydrolase is secreted *via* the pancreatic juice.

1107 THE ROLE OF THE INTESTINAL MUCOSA IN CHOLESTEROL METABOLISM: ITS RELATION TO PLASMA AND LUMINAL CHOLESTEROL. *(E.)* Peng, S. K.; Ho, K. J.; Taylor, C. B. (VA Hosp., Albany, N.Y.). *Exp. Mol. Pathol.* 21(1):138-153, 1974.

Relationships between cholesterol in the intestinal mucosa, lumen, and plasma were studied in 3 groups of adult male albino rats: 13 fed a sterol-free diet, 13 fed a 2% cholesterol diet, and 7 fed a sterol-free diet followed by biliary diversion. Following intracardiac injection of cholesterol-4-^{14}C and sequential sacrifice, total cholesterol content and its radioactivity were measured in sera and in the mucosae and luminal contents of portions of the small intestine and colon. The cholesterol specific activity was greater in serum than mucosa and greater in the mucosa than in the lumen. This suggests 2 pools of cholesterol in the mucosa, 1 active in cholesterol synthesis and the other in total equilibrium with serum cholesterol. With sterol-free diet, 79% of the cholesterol in the active mucosa was synthesized *de novo* and contributed 77% of the fecal cholesterol. Transport from mucosa to lumen was mainly by active secretion and partly by desquamation. Mucosal cholesterol content, specific activity, and transport to the lumen were unaffected by cholesterol diet except for a 20% reduction of *de novo* synthesized cholesterol in the proximal small intestine. Biliary diversion caused a 5- to 6-fold increase of *de novo* synthesized cholesterol and a 2-fold increase in the active mucosal pool. These were attributed to the absence of bile salts which inhibit cholesterol synthesis and enhance absorption of cholesterol in the lacteals.

1108 EXPERIMENTAL ARTIFICIAL GUT BEFORE INTESTINAL TRANSPLANTATION IN DOG. *(E.)* Joyeux, H.; Astruc, B.; Yakoun, M.; Solassol, C. (Lab. Exp. Surg., Montpellier, France). *Eur. Surg. Res.* 6(Suppl. 1):53-54, 1974.

1109 FEATURES OF ENTEROCYTE POPULATION KINETICS IN VARIOUS SEGMENTS OF THE INTESTINAL TRACT AS A FACTOR CAUSING TUMOR DEVELOPMENT. *(Rus.)* Pozharisskii, K. M.; Klimashevskii, V. F.; Gushchin, V. A. (N. N. Petrov Sci. Res. Inst. Oncol., Leningrad, USSR). *Dokl. Akad. Nauk SSSR* 220(1):216-219, 1975.

1110 THE ROLE OF SUPERSENSITIVITY TO ACETYLCHOLINE IN THE PRODUCTION OF TOLERANCE TO MORPHINE IN STIMULATED GUINEA-PIG ILEUM. *(E.)* Shoham, S.; Weinstock, M. (Sackler Sch. Med., Tel Aviv Univ., Ramat Aviv, Israel). *Br. J. Pharmacol.* 52(4):597-603, 1974.

1111 PROTEIN DIGESTION DURING EARLY POSTNATAL DEVELOPMENT. *(Rus.)* Zufarov, K. A.; Tashkhodzhaev, P. I.; Gontmakher, V. M. (Tashkent Med. Inst., USSR). *Biull. Eksp. Biol. Med.* 77(10):12-15, 1974.

1112 EFFECT OF METHIONINE ON PEPTIDASE ACTIVITY OF THE CHICK SMALL INTESTINE. *(Rus.)* Kushak, R. I.; Sanzhur, T. S.; Fomina, G. A. (Inst. Biol., Riga, USSR). *Fiziol. Zh. SSSR* 60(11):1718-1722, 1974.

1113 EFFECT OF ADRENALECTOMY ON MUCOSAL ENZYME ACTIVITY IN THE RAT SMALL INTESTINE. *(Rus.)* Rakhimov, K.; Kadyrov, U. Z.; Zaripov, B. (Dep. Physiol., Acad. Sci. Uzbek SSR, Tashkent, USSR). *Biull. Eksp. Biol. Med.* 77(11):61-64, 1974.

1114 METABOLISM OF SERUM ALBUMIN IN EXPERIMENTAL INTESTINAL OBSTRUCTION. *(E.)* Herczeg, B. (Semmelweis Med. Univ., Budapest, Hungary). *Z. Exp. Chir.* 7(2):112-126, 1974.

1115 THE HYDROLYSIS OF STARCH AND SUCROSE BY THE RAT SMALL INTESTINE WITH IMPAIRED BLOOD SUPPLY AND LIGATED BILIARY AND PANCREATIC DUCTS. *(Rus.)* Pulatov, A. S.; Povetko, T. V. (M. I. Kalinin State Med. Inst., Andizhan, USSR). *Fiziol. Zh. SSSR* 60(11):1712-1717, 1974.

1116 AFFINITY LABELING OF SUCRASE-ISOMALTASE COMPLEX FROM RABBIT SMALL INTESTINE. *(E.)* Quaroni, A.; Di Capua, E.; Semenza, G. (Fed. Tech. Univ., Zurich, Switzerland). *Experientia* 30(6):690, 1974.

1117 THE INFLUENCE OF O-(β-HYDROXYETHYL)-RUTOSIDE (HR) ON INTESTINAL CELLS AFTER PARTIAL IRRADIATION. *(Ger.)* Oberhausen, V. H. (Inst. Biophys., Univ. Saarland, Homburg/Saar, Germany). *Arzneim. Forsch.* 25(1):101-105, 1975.

1118 IMMUNOCHEMICAL STUDY OF LARGE HUMAN INTESTINE ACID PHOSPHATASES. *(E.)* Benoliel, A. M.; Pianeta, C.; Sacoman, N.; Depieds, R. (Med. Teaching Res. Unit, Marseille, France). *Int. J. Biochem.* 5(7/8):667-672, 1974.

1119 SEASONAL CHANGES IN THE CIRCADIAN RHYTHMS OF MITOTIC ACTIVITY IN THE EPITHELIUM OF RECTAL CRYPTS IN RATS. *(Rus.)* Svetikova, K. M.; Katinas, G. S. (Inst. Exp. Med., Leningrad, USSR). *Arkh. Anat. Gistol. Embriol.* 67(7):62-68, 1974.

1120 THYROID CONTROL OF SMALL INTESTINAL OXYGEN CONSUMPTION AND THE INFLUENCE OF SODIUM IONS, OXYGEN TENSION, GLUCOSE AND ANAESTHESIA. *(E.)* Levin, R. J.; Syme, G. (Dep. Physiol., Univ. Sheffiel England). *J. Physiol. (Lond.)* 245(1):271-287, 1975.

See also, 0827, 0834, 0847, 0868, 1038, 1276.

GENERAL

1121 INTESTINAL VASOCONSTRICTION FOLLOWING DIURETIC-INDUCED VOLUME DEPLETION: ROLE OF ANGIOTENSIN AND VASOPRESSIN. *(E.)* McNeill, J. R. (Coll. Med., Univ. Saskatchewan, Saskatoon, Canada). *Can. J. Physiol. Pharmacol.* 52(4):829-839, 1974.

The i.v. administration of furosemide (1.0 or 2.0 mg/kg), ethacrynic acid (2.0 mg/kg) or chlorothiazide (20 mg/kg) induced intestinal vasoconstriction in pentobarbital-anesthetized (30 mg/kg sodium pentobarbital i.p.) cats (1.8-4.0 kg). The parameters in all animals were recorded for 30-60 min before and 90-180 min after administration of the agents. The intestinal vasoconstriction following furosemide was not reduced in animals subjected to acute intestinal denervation, adrenalectomy, and hypophysectomy. The response also was not reduced in animals subjected to intestinal denervation and adrenalectomy and given an inhibitor of angiotensin-converting enzyme, SQ20881 (Pyr-Trp-Pro-Arg-Pro-Gln-Ile-Pro-Pro; 1.0 mg/kg i.v.). However, administration of SQ20881 (1.0 mg/kg i.v. 30-40 min before administration of furosemide) to hypophysectomized animals completely abolished the vasoconstriction even when the intestinal innervation and adrenal glands remained intact. It is suggested that the renin-angiotensin system and the vasopressin system play major roles in the mechanism of intestinal vasoconstriciton following diuretic-induced volume depletion and that the sympathoadrenal system plays little role in this response.

1122 HEPATIC OUTFLOW RESISTANCE, SINUSOID PRESSURE, AND THE VASCULAR WATERFALL. *(E.)* Mitzner, W. (Dep. Biomed. Eng., Johns Hopkins Univ., Baltimore, Md.). *Am. J. Physiol.* 227(3):513-519, 1974.

The pressure-flow characteristics of the hepatic common outflow resistance were determined in 5 anesthetized (25 mg/kg pentobarbital) dogs. Portal venous pressure (P_{pv}) was measured *via* a catheter in the portal vein, and hepatic venous pressure (P_{hv}) was measured *via* a catheter in the left hepatic vein. A shunt containing an electromagnetic flow probe was established between the portal vein and abdominal inferior vena cava just downstream from the renal veins. Normal portal flow perfused the liver for 15 min. Hepatic artery flow was then set at 10 ml/min/kg and the portal flow was diverted into the inferior vena cava. Sinusoid pressure (P_s) was estimated as the pressure in portal vein with no portal inflow to the liver. The arterial flow was set to zero and flow rates increased in small steps. Two or 3 series of increasing-flow steps were performed on each animal and a pressure-flow curve determined. These curves were nearly linear in the range of normal flows, but exhibited a moderate convexity toward the pressure axis at low flows. The estimated (P_s) at zero hepatic flow was found to be higher than the outflow pressure. This closing pressure averaged 1.6 mm Hg relative to the P_{hv}. For an average P_{pv} of 7 mm Hg, P_{hv} of 1.6 mm Hg, and portal venous and hepatic arterial flows of 16.4 and 12.6 ml/min/kg, P_s was estimated to be 6.1 mm Hg. Two possible models (based on electric battery symbols) of the hepatic vasculature are presented. For the outflow resistance, one model assumes a single closing pressure, P_c, and a resistance R_L' which must decrease as P_s increases. The closing pressure is represented by a battery symbol of magnitude P_c-P_{hv} and is in series with R_L'. As long as $P_{hv} < P_c$, there must exist a "vascular waterfall" of this magnitude. For $P_{hv} \geq P_c$, the magnitude of the waterfall is zero. The second model assumes a constant resistance, r_L, with a distribution of closing pressures providing an effective back pressure to flow of P_c'. This average closing pressure generates a vascular waterfall of mean magnitude $P_c' - P_{hv}$, for $P_{hv} < P_c$. For P_{hv} between P_c and the highest individual closing pressure in the bed, there will be a varying number of individual waterfalls, but the model does not hold. For P_{hv} greater than the highest individual closing pressure all waterfalls are zero.

1123 HEPATIC BLOOD FLOW IN THE RAT: EFFECT OF PORTACAVAL SHUNT. *(E.)* Ossenberg, F. W.; Denis, P.; Benhamou, J. P. (INSERM, Beaujon Hosp., Clichy, France). *J. Appl. Physiol.* 37(6):806-808, 1974.

The continuous BSP infusion method was used to assess hepatic blood flow in the rat. Blood from hepatic veins was sampled through a specially designed retrograde catheter. BSP extraction and hepatic blood flow were measured in 7 rats with end-to-side portacaval shunt and in 7 sham-operated rats 2 weeks after operation. BSP extraction was significantly lower in shunted rats than in sham-operated rats, 0.55 *versus* 0.68, resp. Hepatic blood flow/100 g was significantly lower in shunted rats than in sham-operated rats, 4.3 *versus* 7.8 ml/min, resp. As liver weight was lower in shunted than in sham-operated rats, 2.5 *versus* 3.7 g/100 g, resp., the hepatic blood flow/g liver was not significantly different in the two groups, 1.7 and 2.1 ml/min, resp. It was concluded from these data that the portacaval shunt induces a 35% decrease in hepatic blood flow when related to body weight, but does not change the mean value for hepatic blood flow when related to liver weight.

1124 THE CONFORMATIONS OF BILIRUBIN AND ITS ESTERS. *(E.)* Manitto, P.; Ricca, G. S.; Monti, D. (Inst. Org. Chem., Univ. Milan, Italy). *Gaz. Chim. Ital.* 104(7/8):633-637, 1974.

1125 PORTAL HYPOTENSION SAFELY MAINTAINED WITH VASOPRESSIN FOLLOWING HEMORRHAGE. *(E.)* Skivolocki, W. P.; Pace, III, W. G. (Ohio State Univ. Hosp., Columbus). *Eur. Surg. Res.* 6(Suppl. 1):3, 1974.

1126 THE IMMEDIATE EFFECTS OF HEPATIC ARTERY LIGATION ON LIVER HEMODYNAMICS AND LIVER FUNCTION IN THE CAT. *(E.)* Krarup, N.; Larsen, J. A. (Inst. Physiol., Univ. Aarhus, Denmark). *Acta Physiol. Scand.* 91(4):441-446, 1974.

1127 EVALUATION OF ^{14}C-TAUROCHOLATE FOR ESTIMATION OF HEPATIC BLOOD FLOW IN MAN. *(E.)* Paumgartner, G.; Reichen, J.; Preisig, R. (Dep. Clin. Pharmacol., Univ. Bern, Switzerland). *Digestion* 10(4/5):373, 1974.

1128 TRANSPLANTATION OF THE PANCREAS INTO A RETROPERITONEAL JEJUNAL LOOP. *(E.)* Dickerman, R. M.; Twiest, M. W.; Crudup, J. W.; Turcotte, J. G. (Univ. Michigan Med. Cent., Ann Arbor). *Am. J. Surg.* 129(1):48-54, 1975.

1129 CHANGES IN THE ABSORPTIVE CAPACITY OF THE SMALL INTESTINE DURING STEADY INCREASES IN PORTAL PRESSURE. *(Rus.)* Mozzhukhin, A. S.; Eremenko, V. P. (S. M. Kirov Mil. Med. Acad., Leningrad, USSR). *Biull. Eksp. Biol. Med.* 77(10):34-36, 1974.

1130 NUTRITIONAL FEATURES AND ECOLOGY OF PREDOMINANT ANAEROBIC BACTERIA OF THE INTESTINAL TRACT. *(E.)* Bryant, M. P. (Dep. Dairy Sci., Univ. Illinois, Urbana). *Am. J. Clin. Nutr.* 27(11):1313-1319, 1974.

1131 COMPOSITION OF INTESTINAL MICROFLORA IN MAN DURING QUALITATIVE AND QUANTITATIVE CHANGES OF PROTEIN IN THE DIET. *(Rus.)* Shilov, V. M.; Lizko, N. N.; Vysotskii, V. G.; Merkova, T. I. (Inst. Biomed. Probl., Moscow, USSR). *Zh. Mikrobiol. Epidemiol. Immunobiol.* (6):88-92, 1974.

1132 SIGNIFICANCE OF ANAEROBIC SPIROCHETES IN THE INTESTINES OF ANIMALS. *(E.)* Harris, D. L.; Kinyon, J. M. (Coll. Vet. Med., Iowa State Univ., Ames). *Am. J. Clin. Nutr.* 27(11):1297-1304, 1974.

1133 LACTOBACILLI WHICH ATTACH TO THE CROP EPITHELIUM OF THE FOWL. *(E.)* Fuller, R.; Brooker, B. E. (Natl. Inst. Res. Dairy., Shinfield, England). *Am. J. Clin. Nutr.* 27(11):1305-1312, 1974.

1134 STUDY OF ANTIGEN X WHICH IS RESPONSIBLE FOR PRODUCTION OF ANTI-Salmonella typhi ANTIBODIES, PROTECTORS OF THE CHICK EMBRYO. *(Fr.)* Joyeux, Y.; Jouin, H.; Leluc, B.; Staub, A. M. (Pasteur Inst., Paris, France). *C. R. Acad. Sci.* [*D*] *(Paris)* 279:1507-1510, 1974.

See also, 0809, 0848.

DIAGNOSTIC PROCEDURES

1135 DEMONSTRATION OF SUPERFICIAL GASTRIC EROSIONS BY DOUBLE CONTRAST RADIOGRAPHY. *(E.)*

Laufer, I.; Hamilton, J.; Mullens, J. E. (McMaster Univ. Med. Cent., Hamilton, Canada). *Gastroenterology* 68(2):387-391, 1975.

Radiological and endoscopic diagnosis of superficial gastric erosions was reviewed to show the value of double contrast radiography in the diagnosis of these small lesions. Endoscopic examinations were conducted on 267 patients, in 30 of whom such erosions were reported. In 12 patients there were coexisting peptic ulcers of the stomach or duodenum, while in the remainder the erosions were isolated abnormalities. Predisposing factors in 14 patients included acetylsalicylic acid (5), ethanol (4), gastric surgery (2), nongastric surgery (1), prednisone (1) and Crohn's disease (1). Four patients presented with gastrointestinal bleeding, the rest complained of dyspepsia or epigastric pain often like peptic ulcer pain. Twenty-five of the patients were examined by the double contrast method, and superficial gastric erosions were demonstrated radiologically in 13 of them and in 7 others not submitted to endoscopy. The erosions appeared as flat, linear streaks, as dots of barium, or as target-like lesions with a central fleck of barium surrounded by a radiolucent halo. In one patient, a ring-shaped density was demonstrated due to a small blood clot adherent to a gastric erosion. Although patients presenting with acute hemorrhagic gastritis should be examined first by endoscopy, double contrast radiography has been of value in patients presenting after the cessation of bleeding and in patients with vague digestive complaints. It is suggested that this type of examination be applied more widely and that it may eventually become the standard technique for radiological examination of the upper gastrointestinal tract.

1136 INCREASED SENSITIVITY OF THE CHOLYLGLYCINE BREATH TEST FOR DETECTING ILEAL DYSFUNCTION. *(E.)*

Hepner, G. W. (Milton S. Hershey Med. Cent., Hershey, Pa.). *Gastroenterology* 68(1):8-16, 1975.

Deconjugation of bile salts was assessed by measuring the rate of appearance of $^{14}CO_2$ in the breath after administering cholyl(1-^{14}C)glycine to 19 patients with ileal dysfunction (6 men and 3 women mean age 36 yr with ileitis, plus 7 men and 3 women mean age 40 yr with ileal resection), 23 patients with cholesterol cholelithiasis (17 women and 6 men mean age 36 yr) with or without cholecystectomy, and 30 control subjects either healthy (7 men and 7 women mean age 31 yr) or with diarrhea (10 women and 6 men mean age 51 yr). Vitamin B_{12} absorption was also measured in many with ileal dysfunction by determining the recovery of ^{57}Co in the urine (Schilling test). The percentage of administered ^{14}C excreted in breath $^{14}CO_2$ was increased in ileal dysfunction patients, but there was considerable overlap between those with ileal dysfunction and controls. Breath $^{14}CO_2$ was excreted more rapidly in all patients with ileal dysfunction than in controls. Of the calculated 24-hr breath excretion, 78.3% of administered ^{14}C was excreted in 12 hr in ileal dysfunction patients, compared to 39.1% in controls. Only 1 of the 19 patients with ileal dysfunction overlapped the controls. The Schilling test was normal or equivocal in 5 of 14 patients with ileal dysfunction. The percentage of administered ^{14}C excreted in breath $^{14}CO_2$ was increased in patients with cholecystectomy, but excretion was not more rapid than in controls. The data suggest that the sensitivity of the breath test for diagnosing ileal dysfunction may be usefully increased by determining the rate of excretion of breath $^{14}CO_2$. These data further suggest that the increased exposure of the bile acid pool to deconjugating bacteria in patients with cholesterol cholelithiasis and cholecystectomy is small compared with that seen in ileal dysfunction patients, and there is no increased fecal loss of ^{14}C from cholyl (1-^{14}C)glycine in these patients.

1137 CHANGES IN SERUM PHOSPHATE LEVELS ASSOCIATED WITH INTESTINAL INFARCTION AND NECROSIS.

(E.) Jamieson, W. G.; Lozon, A.; Durand, D.; Wall, W. (no affil.). *Surg. Gynecol. Obstet.* 140(1):19-21, 1975.

Serum phosphate determinations were made in 7 patients with massive intestinal infarction. The phosphate levels were elevated in each of the 7, 6 of whom had mesenteric vascular occlusion and 1 had midgut volvulus with intestinal necrosis. Experimental ligation and division at the origin of superior mesenteric artery was carried out in 25 mongrel dogs while an additional 15 underwent ligation and division of the superior mesenteric vein at its junction with the portal vein. The dogs had bloody diarrhea at 4 to 6 hr after operation. They were lethargic and febrile. Inorganic phosphate levels were significantly elevated in all dogs having ligation of the superior mesenteric artery. The phosphate levels were less elevated in those undergoing venous ligation. Hemoglobin and hematocrit levels were also elevated. Portal venous blood showed marked elevation of inorganic phosphate after ligation of the superior mesenteric artery. A significant metabolic acidosis with base deficit occurred, probably due to flooding of the systemic circulation with inorganic phosphate ion. Autopsy confirmed intestinal infarction in all dogs. Bioassay showed significantly higher levels of inorganic phosphate in the jejunum compared with other tissues. It was concluded that the serum phosphate level is increased in patients with massive intestinal necrosis. If only a small area of intestine is necrotic, however, the peripheral vein serum phosphate levels do not rise and the released phosphate fails to escape the liver. It is suggested that elevated serum phosphate levels, metabolic acidosis with significant base deficit, elevated WBC, and elevated hemoglobin and hematocrit values, when coupled with pertinent clinical signs and symptoms, may indicate the need for laparotomy and thus shorten the time period between vascular occlusion and operation.

1138 CHOLECYSTOKININ CHOLANGIOGRAPHY AND ANALYSIS OF DUODENAL BILE IN THE INVESTIGATION OF PAIN IN THE RIGHT UPPER QUADRANT OF THE ABDOMEN WITHOUT GALLSTONES. *(E.)*

Freeman, J. B.; Cohen, W. N.; DenBesten, L. (Univ. Iowa Hosp. Clin.,

wa City). *Surg. Gynecol. Obstet.* 140(3):371-376,
75.

prospective study was carried out to test the hy-
thesis that the combined use of preoperative
olecystokinin cholangiography, duodenal drainage,
d analysis of biliary lipids will enable the se-
ction of those who would benefit from laparotomy.
tients (31; 29 female) with persistent biliary
act symptoms and at least two normal oral chole-
stograms were studied. The symptoms consisted of
in in the epigastric or right upper quadrant re-
on, frequently with radiation to the right scapu-
. Based on combined cholecystokinin cholangio-
aphy and biliary drainage studies, cholecystectomy
s performed in 22 patients. The indication for
rgery in 10 cases was a reduplication of clinical
mptoms with pain lasting for at least 10 min after
olecystokinin injection. The symptoms were caused
resistance to gallbladder emptying, secondary to
scoordinate contractions at the neck of the gall-
adder or to obstruction of the cystic duct. In
ven other patients, there was a virtual absence of
llbladder contractility, without pain, following
olecystokinin injection. The symptoms were due to
pokinetic contractions, and no patient had occlu-
on of the cystic duct. In five additional pa-
ents, there was neither pain nor delayed emptying
the gallbladder after cholecystokinin injection.
ch of these patients had supersaturated duodenal
le with crystals and/or bacteria. Twenty pa-
ents recovered completely following surgery, and
e other two showed definite improvement; there
re no therapeutic failures. Cholecystokinin
olangiography quickly and capably detects the
esence of neuromuscular disease of the gallbladder
ll, and, combined with microscopic and bacteriolo-
c examination of the duodenal bile, has great po-
ntial benefit for the patient and clinician.

39 LIMITATIONS OF THE USEFULNESS OF THE d-XYLOSE ABSORPTION TEST. *(E.)* Krawitt, E.
; Beeken, W. L. (Dep. Med., Univ. Vermont, Bur-
ngton). *Am. J. Clin. Pathol.* 63(2):261-263, 1975.

e results of the conventional 5-hr *d*-xylose ab-
rption test were surveyed in 38 subjects with dis-
se of the jejunal mucosa (including celiac sprue,
ipple's disease, intestinal lymphangiectasia and
mphoma), giardiasis, or small-intestinal bacterial
ergrowth. None of the patients had renal dysfunc-
on or neurologic defects. All were hydrated and
d adequate urinary volumes. Although the results
d-xylose excretion tests of patients tended to
abnormal, and those of controls generally fell
to the normal range, there was marked overlap in
l groups. Two patients with severe celiac sprue
owed normal *d*-xylose excretion values. These
ta indicate that the *d*-xylose test as it is con-
ntionally performed results in false-positives and
lse-negatives in about 30% of the subjects tested,
gardless of diagnosis. Thus, in any individual
se it has limited usefulness in providing meaning-
l data in either identifying malabsorption or
ading to a small-bowel biopsy, a search for the
esence of giardiasis, or a quantitative small-bowel culture. It is concluded that there is no reason to perform the conventional *d*-xylose absorption test in the work-up of patients when jejunal biopsies can be easily and safely obtained.

1140 CARCINOMA OF THE PANCREAS: DETECTION AND MONITORING BY CARCINOEMBRYONIC ANTIGEN (CEA) AND ULTRASONOGRAPHY. *(E.)* Lokich, J. J.; Chawla, P. L.; Smith, E. H.; Zamcheck, N. (Harvard Med. Sch., Boston, Mass.). *Am. J. Gastroenterol.* 62(6):481-487, 1974.

Twenty-three patients (15 men and 8 women, aged 40-84 yr) with pancreatic carcinoma were followed sequentially by serial plasma carcinoembryonic antigen (CEA) determinations and abdominal ultrasonography. Five patients with normal CEA levels (less than 2.5 ng/ml) survived from less than 3 months to more than 12 months, median 8 months. CEA levels were elevated in 17 patients (74%). With hepatic metastasis, CEA levels ranges from 2.5 to 45 ng/ml, with 50% of these falling in the 2.5 to 15 ng/ml range. For those with levels up to 10 ng/ml, survival was similar to patients with normal CEA levels. Patients with hepatic metastasis and levels of CEA below 15 ng/ml had a longer survival which was not related to quantitative differences in tumor bulk. Of the seven patients with initial CEA levels over 10 ng/ml, all survived less than 6 months, and 3 less than 3 months, median 4 months. Thus, high CEA levels of over 10 ng/ml are generally indicative of a poor prognosis while levels less than 10 ng/ml indicate longer median survival. A direct correlation of serial CEA levels with clinical disease activity was established in a majority of the 10 cases in which it was investigated. A rising CEA level in increments of more than 3 ng/ml indicated the onset of metastatic disease, particularly for those patients with initial CEA levels of less than 15 ng/ml. A specific correlation of CEA levels with regressive disease was possible in only 1 patient. Ultrasonography was performed in 12 patients with pancreatic cancer. In all but 1 patient detection of a mass lesion was possible. Five patients had multiple ultrasound examinations during the course of the disease to monitor response to chemotherapy. No clinical response to therapy was observed, and in all 5 progressive enlargement of pancreatic mass lesions or retroperitoneal disease was determined by ultrasound. In general, the ultrasound could detect the lack of tumor response prior to clinical deterioration. Sequential ultrasound examinations were related to CEA levels to provide evidence of recurrent disease in 1 case, thus allowing a change in therapeutic regimen to be instituted earlier. The combined use of CEA determinations and ultrasonography to monitor patients with pancreatic carcinoma is useful in clinical management. The major advantages of these techniques are their simplicity and the direct quantitation of tumor mass.

1141 A COMPARISON BETWEEN SECRETIN ALONE AND SEQUENTIAL AND SIMULTANEOUS SECRETIN AND CHOLECYSTOKININ ADMINISTRATION IN THE ASSESSMENT OF PANCREATIC FUNCTION. *(E.)* Clain, J.; Bank, S.; Barbezat, G. O.; Novis, B. H.; Marks, I. N. (Groote Schuur

Hosp., Cape Town, South Africa). *Gut* 15(11):885-888, 1974.

A study was undertaken to compare sequential and simultaneous hormone administration, and to establish whether secretin alone was comparable to secretin combined with cholecystokinin as a stimulus to pancreatic secretion. Twenty-five patients with suspected pancreatic disease participated in the study. Each patient underwent 2, 80-min pancreatic function tests, in tandem, the first separated from the second by 30 min. For these tests submaximal doses of the hormones were administered by slow i.v. infusion. Five patients received secretin followed 60 min later by cholecystokinin for both tests. A second group of 5 patients received secretin followed 60 min later by cholecystokinin for the first test, and received secretin and cholecystokinin simultaneously in the second test. This order of the tests was reversed in a third group of 5 patients. In a fourth group, secretin was given first, followed by cholecystokinin at 60 min for the first test, and cholecystokinin was given first followed by secretin at 20 min for the second test. In a final group of 5 patients, this order of testing was reversed. Results of these studies indicated that volume, bicarbonate concentration, and enzyme secretion were the same whether secretin was followed by cholecystokinin or cholecystokinin followed by secretin or the two hormones were given simultaneously. When comparing patients who received a 60-min secretin stimulation alone with those who received a 60-min combined stimulation with secretin and cholecystokinin, the mean volume output and bicarbonate concentrations were similar, but the addition of cholecystokinin affected the mean enzyme concentration. This concentration was higher for all 4 enzymes in the test, although only significantly so for trypsin. It was concluded that cholecystokinin increases the concentration of enzymes in the pancreatic juice, but that its time of administration in relation to secretin is not critical in the assessment of pancreatic function.

1142 SPECIFICITY OF INCREASED RENAL CLEARANCE OF AMYLASE IN DIAGNOSIS OF ACUTE PANCREATITIS. *(E.)* Warshaw, A. L.; Fuller, Jr., A. F. (Massachusetts Gen. Hosp., Boston). *N. Engl. J. Med.* 292(7):325-328, 1975.

The amylase:creatinine clearance ratio was calculated in 86 patients with hyperamylasemia. These patients had acute pancreatitis (32 cases); common-duct obstruction with (10) or without pancreatitis (11); benign peptic ulcer of the stomach or duodenum (9); salivary adenitis (4); intestinal obstruction (5); intestinal ischemia (2); and regional enteritis (2); macromaylasemia (3); diabetic ketoacidosis (1); renal failure (1); liver trauma (3); hepatitis (2); and perforated duodenal ulcer (1). In this patient population the distribution of amylase values was similar whether patients had acute pancreatitis or another disease. The 3 patients with the highest levels of serum amylase did not have pancreatitis. The amylase:creatinine clearance in controls averaged 3.1%. In acute pancreatitis with or without an associated common-duct stone, only 3 of 42 patients had a clearance ratio below 5.3%. In contrast, the amylase:creatinine clearance ratio remained within the normal range in 44 patients with hyperamylasemia due to disease other than pancreatitis. The ratio of urinary amylase concentration to urinary creatinine concentration rose markedly in acute pancreatitis, but similar rises occurred in patients with hyperamylasemia resulting from other diseases. Serum lipase did not distinguish pancreatitis patients with or without common stones from patients with stones but without pancreatitis. These results suggest that renal permeability to amylase is altered in acute pancreatitis, and provides a basis for using the amylase:creatinine clearance ratio in the differential diagnosis of hyperamylasemia.

1143 PLASMA ALKALINE PHOSPHATASE ISOENZYMES IN HEPATOBILIARY DISEASE. *(E.)* Afonja, A. O.; Baron, D. N. (R. Free Hosp., London, England). *J. Clin. Pathol.* 27(11):916-920, 1974.

Plasma alkaline phosphatase isoenzyme patterns were investigated by cellulose acetate or acrylamide gel electrophoresis in a variety of hepatobiliary disorders and in some other conditions for comparison. Normal sera were obtained from fasting laboratory staff and from children with unrelated complaints. Abnormal sera were obtained from patients with hepatobiliary disorders. The sera were analyzed first for total alkaline phosphatase activity by the kinetic method to determine the amount of serum needed for electrophoresis. On cellulose acetate, 6 µl of serum containing less than 20 King-Armstrong (KA) U/dl was used, while 3 µl was sufficient for serum containing higher activities. On acrylamide gel, 25 µl of serum containing less than 30 KA U/dl was used; when 30-60 KA U/dl, 20 µl; 60-90 KA U/dl, 15 µl; 90-120 KA U/dl, 10 µl; 120-150 KA U/dl, 5 µl. The serum was diluted with aqueous sucrose solution (20 g/dl) if the activity exceeded 150 KA U. Since the heat-stable placental and Regan isoenzymes have a mobility similar to but distinguishable from the bone isoenzyme, their presence was confirmed by repeating the electrophoretic separation after destroying the bone isoenzyme by heat. Differentiation of intestinal from liver isoenzyme was confirmed by its sensitivity to 5 mM/liter of L-phenylalanine, while bone and liver isoenzymes were characterized by their sensitivity to 25 mM/liter of L-homoarginine. Acrylamide electrophoresis was performed at 4 C for 6 hr at 90 V, and cellulose acetate electrophoresis at room temperature for 18 min at 200 V. The order of separation of isoenzymes from sera from typical clinical cases is as follows: (anode) fast liver, slow liver, placental Regan, bone, intestinal, bile (origin): (cathode). The acrylamide gel method separated the bone and 'slow' liver isoenzymes more clearly but the bile isoenzyme could not be identified with certainty. Results were otherwise identical with either method. Normal adult serum always contained slow-liver isoenzyme, and sometimes bone isoenzyme; the latter was always present in the serum of children. In hepatobiliary disease slow-liver isoenzyme was always increased; intestinal isoenzyme appeared in many cases of cirrhosis (blood groups B and 0) but fast-liver and bile isoenzymes were occasionally seen in miscellaneous cases. Regan isoenzyme was found in 6 of 45 cases of malignant disease. It is concluded that the ease of setting up and the short time required for adequate electrophoretic separation make the cellulose acetate strip a suitable method for the routine analysis of alkaline phosphatase isoenzymes in the serum.

1144 GAMMA-GLUTAMYL TRANSPEPTIDASE: CHOLESTATIC OR CYTOLYTIC ENZYME? *(Fr.)* Bertrand, L.; Arnefaux, J. (St. Eloi Hosp., Montpellier, France). *J. Med. Lyon* 54(1240):29-35, 1973.

To ascertain their relative value in diagnosis and follow-up, comparisons were made of serum γ-glutamyl transpeptidase (GGT), total bilirubin, alkaline phosphatase, and SGOT in 948 patients with a variety of liver and other diseases. GGT values were moderately increased in 63 patients with viral hepatitis, 3 with primary biliary cirrhosis, and 29 with alcoholic steatosis; SGOT was more useful in the diagnosis and follow-up of viral hepatitis. Much higher values of GGT were found in 10 patients with alcoholic necrosis and in 32 with obstructions of the extrahepatic biliary tract. Very high values (about 440 U/liter) were found in patients with incomplete obstruction due to choledocholithiasis (14 cases) or stenosis of the sphincter of Oddi (3 cases), while somewhat lower values (about 320 U/liter) were present in 15 patients with complete biliary obstructions caused by tumors in the head of the pancreas. Alkaline phosphatase values were similarly increased, but to a lesser extent. Surgical removal of the obstruction was followed by a rapid decrease in GGT values. Very large increases in GGT were also found in 35 patients with liver cancer: these values were higher among 19 patients with hepatic metastases than among 16 with primary liver cancer. Because GGT values gradually increase, they are valuable for early diagnosis of hepatic metastases. No increase occurred in GGT in 14 patients with cholestasis of pregnancy although alkaline phosphatase values doubled. On the basis of these findings and experimental findings reported in the literature, it is concluded that GGT is an indicator of hepatic necrosis rather than of cholestasis or cytolysis.

1145 SCAN EVIDENCE OF DECREASE IN SIZE OF INTRAHEPATIC TUMORS AFTER CHEMOTHERAPY. A CASE REPORT. *(E.)* Witek, J. T.; Spencer, R. P. (Yale Univ. Sch. Med., New Haven, Conn.). *Gastroenterology* 67(3):516-518, 1974.

Three cases are presented in which there was scan-documented metastatic tumor in the liver. A 38-yr-old woman showed, at laparotomy, an extensive carcinoma of the cecum. A mass, present in the right lobe of the liver, proved to be a metastatic carcinoma. The patient was started on 5-fluorouracil, and a repeat scintiscan obtained 49 days after the first study showed a decrease in the size of the lesion. A liver scintophoto in a 70-yr-old man who had been seen 7 yr previously for resection of carcinoma of the rectosigmoid, revealed an organ 19 cm in length, with at least 1 large defect in the upper portion of the right lobe. Therapy with 5-fluorouracil was begun and a repeat scintiscan, obtained 82 days after the first study, revealed almost complete disappearance of the defect. A 52-yr-old man had a nephrectomy for transitional cell carcinoma of the left kidney and 3 months later a liver scintophoto showed several defects. A course of adriamycin was administered at monthly intervals for a total of 6 courses. A repeat liver scintophoto 11 months after the initial study revealed almost complete reversion to normal. It is concluded that liver scans can provide one of the few objective criteria of the response to chemotherapy.

1146 A COMPARISON OF THE ACCURACY OF PERITONEOSCOPY AND LIVER BIOPSY IN THE DIAGNOSIS OF CIRRHOSIS. *(E.)* Bruguera, M.; Bordas, J. M.; Mas, P.; Rodes, J. (Prov. Hosp. Clin., Univ. Barcelona, Spain). *Gut* 15(10):799-800, 1974.

The accuracy of peritoneoscopy and liver biopsy in the diagnosis of hepatic cirrhosis was compared in 473 consecutive patients submitted to both procedures. Cirrhosis was diagnosed by one or both methods in 152 of these patients. There was 73% agreement (111 cases) between the two procedures. Of the 41 cases in which a discrepancy existed, cirrhosis was diagnosed histologically in 27 and peritoneoscopically in 14. The apparent false-negatives were 17.7% for peritoneoscopy and 9.3% for liver biopsy. The etiology of the 152 cases of cirrhosis were: cryptogenic 83, alcoholic 64, Wilson's disease 2, and 1 each for idiopathic hemochromatosis, Thorotrast, and secondary biliary cirrhosis. Of the 27 patients diagnosed incorrectly by liver biopsy, 26 had hepatic fibrosis and 1 had a normal liver. Of the 14 patients diagnosed incorrectly by peritoneoscopy, 3 had chronic aggressive hepatitis, 2 alcoholic hepatitis, 1 submassive hepatic necrosis, 1 normal liver, 1 nonspecific reactive hepatitis and 6 were not diagnostic. Although this study showed a high accuracy for peritoneoscopy and liver biopsy singly, 82.3% and 90.7%, resp., combining the methods afforded a significant increase in positive results. It is suggested that combined peritoneoscopy and biopsy methods be incorporated into the diagnostic procedure for suspected cirrhosis.

1147 ANGIOGRAPHIC FINDINGS OF CHOLEDOCHAL CYST. *(E.)* Jacobs, R. P.; Palubinskas, A. J. (Univ. California Sch. Med., San Francisco). *Br. J. Radiol.* 48:51-52, 1975.

An 18-yr-old girl presented for evaluation of a mass in the right upper quadrant of the abdomen which she had noted 10 days earlier. The mass was large, soft, non-tender and distinct from the liver. Laboratory studies indicated biliary obstruction: bilirubin was 3.1 mg/dl, alkaline phosphatase 319 IU/liter. Excretory urography showed a large mass with cephalad displacement of the right kidney with stretching of the right ureter. Barium enema showed depression of the hepatic flexure and anterior displacement of the proximal aspect of the transverse colon. Upper gastrointestinal tract examination showed slight displacement of the stomach to the left and marked anterior displacement, stretching and effacement of the descending duodenum. A liver scintiphoto study showed a normal sized liver with 2 large, central zones of decreased activity. At this stage the working diagnosis was abdominal malignancy with hepatic metastasis. Celiac arteriograms showed the mass was cystic, stretching the gastroduodenal artery and its branches anteriorly and elevating the right hepatic and cystic arteries. Superior mesenteric arteriography showed displacement of the inferior pancreaticoduodenal, the right colic, and the ileocolic branches about the cyst. A preoperative diagnosis of choledochal cyst was made by these angiographic findings: retroduodenal cyst of right upper quadrant; normal cystic artery without evidence of gallbladder distension; no angiographic evidence of malignancy; and central, tubular defects in the hepatogram phase. This may be the first case in which diagnosis was made by angiography.

1148 GALL-BLADDER EMPTYING MEASURED BY A RADIOISOTOPIC METHOD. *(E.)* Chapple, M. J.; Nolan, D. J.; Low-Beer, T. S.; Davies, E. R. (United Bristol Hosp., England). *Br. J. Radiol.* 48(565):19-22, 1975.

Oral radioisotope cholecystography was used to measure gallbladder emptying in 34 patients. In order to test the principle of the method a model was constructed using a balloon immersed in a water bath. Each of the 34 patients was being tested for suspected gallbladder disease. On the evening before examination the patient took 3 g sodium ipodate with a small volume of 10 μCi ^{131}I sodium ipodate in solution. The next morning the standard examination of the gallbladder was conducted. Gallbladder films were taken to measure gallbladder volume and localize the surface markings of the gallbladder. A collimated scintillation counter was suspended vertically over the area of maximal radioactivity. The recordings began immediately before ingestion of an emulsion of 20 ml arachis oil and continued until contraction of the gallbladder was maximal. Another radiograph in the supine position was taken at the end of the examination. The results of the study indicate that the isotope cholecystogram is a satisfactory method of monitoring emptying of the contracting gallbladder. Its results correlate well with changes in volume measured radiographically and it has the advantage of showing the pattern of contraction as well as the degree. Its ease and low radiation hazard make it a useful technique for studying gallbladder function. If combined with cholecystokinin assay, it may be useful in investigating the relation between gallbladder malfunction and disorders of intestinal function which may be associated with abnormalities of cholecystokinin release.

1149 SERUM LYSOZYME IN CROHN'S DISEASE AND ULCERATIVE COLITIS. *(E.)* Falchuk, K. R.; Perrotto, J. L.; Isselbacher, K. J. (Harvard Med. Sch., Boston, Mass.). *N. Engl. J. Med.* 292(8):395-397, 1975.

Serum lysozyme (muramidase) concentrations were determined in patients with different types of inflammatory bowel disease and in normal subjects. The patients included 20 with ulcerative colitis (13 males and 7 females aged 10-73 yr); 25 with Crohn's disease (12 males and 13 females aged 12-78 yr); 2 with salmonella enterocolitis (aged 18 and 24 yr); and 4 with nonbacterial enteritis (19-34 yr). The mean lysozyme concentration for each group was as follows: controls, 8.8 μg/ml; ulcerative colitis, 9.3; Crohn's disease, 26.3; and bacterial or nonbacterial enteritis, 8.9. The mean enzyme level for Crohn's disease patients was significantly greater than for other groups. Also, there was no overlap of the serum lysozyme concentration between patients with Crohn's disease and those with ulcerative colitis. In Crohn's disease, no correlation was found between the serum lysozyme concentration and the extent of disease. The highest serum lysozyme concentrations in patients with ulcerative colitis were found in a patient with toxic megacolon and a patient with severe ulcerative colitis in whom peritonitis secondary to a colonic perforation developed. No correlation was noted between the serum lysozyme concentration and total WBC. Neither was there a correlation between serum lysozyme and the absolute number of circulating granulocytes and monocytes. The elevation of serum lysozyme in Crohn's disease may be related to tissue macrophages. It is concluded that an increased level of serum lysozyme may help differentiate Crohn's disease from idiopathic ulcerative colitis.

1150 ASSESSMENT OF AMOEBIASIS: SERODIAGNOSIS BY IMMUNOFLUORESCENCE WITH LYOPHILIZED ENTAMOEBAE. *(E.)* Cox, J. C.; Nairn, R. C. (Monash Univ. Med. Sch., Melbourne, Australia). *J. Clin. Pathol.* 27(12):1018-1019, 1974.

Human sera were collected from cases of amebic colitis or amebic hepatitis. Slides of sera smears were prepared and the sandwich immunofluorescence method was applied using 0.1% Evans blue as counterstain to reduce background fluorescent staining and to give a distinct titration endpoint. FITC-labeled goat antihuman globulin was used as a conjugate at 5 mg/ml. The results obtained with the immunofluorescence antibody titration were reproducible. The four positive sera tested in 2 assessments gave the same immunofluorescence titer in 3 cases while the 4th varied by only 1 doubling dilution. Assessment of amebiasis was also made by using seramoeba latex agglutination kits as directed. Results when using the latex particle agglutination showed insufficient sensitivity in that 5 false negatives and 1 false positive were recorded. Thus, although the latex agglutination is a simpler procedure for serological diagnosis, it is less reliable and lacks sufficient sensitivity for routine use. This lack of sensitivity may be due to the fact that agglutination techniques are especially sensitive to IgM which has not been regularly detected in amebiasis serology. IgG is the major immunoglobulin found.

51 COMPARATIVE STUDY BETWEEN ENDOSCOPY AND
RADIOLOGY IN ACUTE UPPER GASTROINTESTINAL
EMORRHAGE. *(E.)* Hoare, A. M. (King's Coll. Hosp.,
ndon, England). *Br. Med. J.* 1(5948):27-30, 1975.

52 EMERGENCY GASTROINTESTINAL ANGIOGRAPHY:
DIAGNOSIS AND TREATMENT. *(Fr.)* Jacot, C.;
rard, J. D.; Humair, L. (La Chaux-de-Fonds Hosp.,
itzerland). *Helv. Med. Acta* 37(5/6):404, 1974.

53 ROLE OF ENDOSCOPY IN DIAGNOSIS AND THERAPY
OF GASTROINTESTINAL PRECANCER. *(Ger.)*
tenjann, R. (Neuperlach Munic. Hosp., Munich, Ger-
ny). *Langenbecks Arch. Chir.* 337:767-770, 1974.

54 RADIOIMMUNOASSAY OF ALPHA-FETOPROTEIN. V.
INFLUENCE OF AGE ON THE PHYSIOLOGICAL SERUM
PHA-FETOPROTEIN LEVEL IN MAN AND IN RAT. *(E.)*
sseyeff, R.; Gilli, J.; Krebs, B.; Bonet, C.;
ihen, H. (Fac. Med., Nice, France). *Biomedicine*
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55 TECHNIQUE, INTERPRETATIVE PRINCIPLES, COM-
PLICATIONS, AND INDICATIONS FOR SELECTIVE
DOMINAL ARTERIOGRAPHY. *(Sp.)* Garcia Diaz, S.;
ntillana Martinez, J. (Fac. Med., Seville, Spain).
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56 ENDOSCOPY IN PATIENTS WITH UPPER GASTROIN-
TESTINAL BLEEDING. EXPERIENCE WITH 386
TIENTS. *(Fr.)* Bodin, F.; Lichtenstein, H.; Roudier,
; Conte, M. (St. Antoine Hosp., Paris, France).
ch. Fr. Mal. App. Dig. 63(3):385-389, 1974.

57 FIBEROPTIC GASTROINTESTINAL ENDOSCOPY IN
INFANTS AND CHILDREN. *(E.)* Gleason, Jr.,
A.; Tedesco, F. J.; Keating, J. P.; Goldstein, P.
(Washington Univ. Sch. Med., St. Louis, Mo.). *J.*
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58 RESULTS OF COMBINED CYTOLOGIC AND HISTO-
LOGIC EXAMINATIONS IN GUIDED BIOPSIES OF
8 TUMORS OF THE STOMACH AND ESOPHAGUS. *(Ger.)*
tertag, H.; Atay, Z.; Georgii, A. (Med. Coll.,
nnover, Germany). *Verh. Dtsch. Ges. Pathol.*
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59 EXFOLIATIVE CYTOLOGY OF THE GASTROINTESTINAL
TRACT (REPORT). *(Ger.)* Witte, S. (Deacon-
s Hosp., Karlsruhe-Ruppruhr, Germany). *Verh. Dtsch.*
s. Pathol. 57:126-138, 1973.

60 THE COMBINED USE OF CYTOLOGY AND HISTO-
MORPHOLOGY IN THE DIAGNOSIS OF STOMACH
SEASE. *(Ger.)* Pantucek, F. (Pathol. Inst., Univ.
enna, Austria). *Verh. Dtsch. Ges. Pathol.* 57:
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1161 TECHNIQUE OF AND PROSPECTS FOR GASTROSCOPIC SNARE BIOPSIES. *(Ger.)* Lindner, H.; Mitschke, H. (DRK Hosp., Hamburg, Germany). *Dtsch. Med. Wochenschr.* 99(10):468-469, 1974.

1162 ENDOSCOPIC SNARE BIOPSIES OF THE STOMACH. *(Ger.)* Deyhle, P. (Dep. Intern. Med., Univ. Zurich, Switzerland). *Dtsch. Med. Wochenschr.* 99(10):464-465, 1974.

1163 MASSIVE HEMORRHAGES FROM GASTRIC AND DUODENAL ULCERS: EMERGENCY DIAGNOSIS. *(Ger.)* Eichfuss, H. P.; Soehendra, N.; Wehling, H. (Surg. Clin., Univ. Hamburg, Germany). *Dtsch. Med. Wochenschr.* 99(35):1729-1731, 1974.

1164 CELLULAR CHANGES IN GASTRIC ULCERS AS SEEN BY EXFOLIATIVE CYTOLOGY. *(Ger.)* Schneider, M. L.; Maass, E. G.; Wiendl, H. J. (Inst. Clin. Surg., Tech. Coll., Munich, Germany). *Verh. Dtsch. Ges. Pathol.* 57:297-298, 1973.

1165 RADIOLOGIC EXAMINATION OF THE SMALL INTESTINE. *(Ger.)* Lenz, H. (St. Antonius Hosp., Eschweiler, Germany). *Radiologe* 14(9):393-403, 1974.

1166 PROBLEMS IN THE RADIOLOGICAL DIAGNOSIS OF TUMORS OF THE SMALL INTESTINE. *(Fr.)* Queloz, J.; Realini, S.; Candardjis, G. (Cantonal Hosp., Lausanne, Switzerland). *Arch. Fr. Mal. App. Dig.* 63(4):269-278, 1974.

1167 ENDOSCOPY OF THE SMALL INTESTINE. *(Ger.)* Fruhmorgen, P.; Classen, M. (Med. Clin., Univ. Erlangen-Nuremberg, Erlangen, Germany). *Radiologe* 14(9):404-408, 1974.

1168 THE IMPORTANCE OF CERTAIN ANOMALIES OF THE DUODENUM AND BILIO-PANCREATIC QUADRANGLE IN ENDOSCOPIC EXPLORATION OF THE DUODENAL PAPILLA. *(It.)* Farello, G. A.; Fratton, A.; Querci, G.; Della Rovere, G.; Gandolfi, P. (Inst. Surg. Pathol., Univ. Padua, Verona, Italy). *Chir. Gastroenterol.* 8(1):35-53, 1974.

1169 TECHNIQUE FOR BIOPSIES OF THE SMALL INTESTINE MUCOSA: PREMEDICATION AND OPERATION OF THE CAPSULE. *(Ger.)* Gaze, H. (no affil.). *Helv. Paediatr. Acta* (suppl) 33:23-24, 1974.

1170 COMPUTER-AIDED DIAGNOSIS OF LOWER GASTROINTESTINAL TRACT DISORDERS. *(E.)* de Dombal, F. T.; Clamp, S. E.; Leaper, D. J.; Staniland, J. R.; Horrocks, J. C. (Univ. Dep. Surg., Leeds, England). *Gastroenterology* 68(2):252-260, 1975.

1171 MESENTERIC ARTERIOGRAPHY IN INTESTINAL DISEASE. *(Sp.)* Garcia Diaz, S.; Cantillana Martinez, J. (Fac. Med., Univ. Seville, Spain). *Rev. Esp. Enferm. Apar. Dig.* 44(4):243-250, 1974.

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1184 NONSPECIFICITY OF THE RADIOCOLLOID HEPATIC "HOTSPOT" FOR SUPERIOR VENA CAVAL OBSTRUCTION. *(E.)* Hattner, R. S.; Shames, D. M. (Univ. California Med. Cent., San Francisco). *J. Nucl. Med.* 15(11):1041-1043, 1974.

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1190 A REVIEW OF OVER ONE THOUSAND CASES IN WHICH LAPAROSCOPY WAS CARRIED OUT FOR DIAGNOSIS OF DISEASE OF THE LIVER AND BILE DUCTS. *(It.)* Infranzi, A.; Sessa, R. (A. Cardarelli Gen. Reg. Hosp., Naples, Italy). *Chir. Gastroenterol.* 8(1):54-57, 1974.

1191 METABOLIC SPYING: LIVER AND BILIARY FUNCTION TEST WITH BENGAL ROSE. *(Ger.)* Subowski, G.; Rjasanskaja, G. (no affil.). *Exakt* (9):26-28, 1974.

1192 DETERMINATION OF LACTATE DEHYDROGENASE FRACTIONS IN THE DIAGNOSIS OF MALIGNANT METASTASES IN THE LIVER. *(Pol.)* Alwasiak, Z.; Dziewaltowska, D.; Joss, A. (Acad. Med., Lodz, Poland). *Wiad. Lek.* 27(14):1265-1268, 1974.

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1196 LAPAROSCOPIC DIAGNOSIS OF HEPATITIS. *(Sp.)* Solis Herruzo, J. A. (1st October Munic. Sanit., Madrid, Spain). *Rev. Esp. Enferm. Apar. Dig.* 44(4):351-364, 1974.

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1202 PERCUTANEOUS TRANSHEPATIC CHOLANGIOGRAPHY. *(E.)* Cline, R. L.; Matallana, R. H.; Crummy, A. B. (Univ. Wisconsin Cent. Health Sci., Madison). *Australas. Radiol.* 18(2):191-197, 1974.

1203 ENDOSCOPIC VISUALIZATION OF THE PANCREATIC AND BILIARY DUCTS. *(E.)* Waye, J. D. (Mt. Sinai Hosp., City Univ. New York, N.Y.). *Mt. Sinai J. Med. NY* 42(1):35-56, 1975.

1204 ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY IN DIAGNOSIS OF BILIARY DISEASE. *(Ger.)* Deyhle, P.; Nette, L.; Ammann, R. (Dep. Intern. Med., Univ. Zurich, Switzerland). *Helv. Chir. Acta* 41(5/6):587-593, 1974.

1205 CHOLANGIOSCOPY DURING SURGERY. *(Ger.)* Berchtold, R.; Ghielmetti, C. (Inselspital, Bern, Switzerland). *Helv. Chir. Acta* 41(5/6):601-602, 1974.

1206 INDICATIONS FOR PERCUTANEOUS TRANSHEPATIC CHOLANGIOGRAPHY (PTC) AND ENDOSCOPIC RETROGRADE PANCREATICOCHOLANGIOGRAPHY (ERPC). *(Ger.)* Weber, A. P.; Schwarz, H. (Limmattal Hosp., Schlieren, Switzerland). *Helv. Chir. Acta* 41(5/6):619-623, 1974.

1207 SIMPLIFIED CHOLANGIOMANOMETRY AND FLOW MEASUREMENT DURING SURGERY. *(Ger.)* Tondelli, P.; Allgower, M. (Cantonal Hosp., Basel, Switzerland). *Helv. Chir. Acta* 41(5/6):609-613, 1974.

1208 CHOLANGIOGRAPHY AND RADIOMANOMETRY DURING SURGERY. *(Fr.)* Rohner, A. (Surg. Clin., Univ. Geneva, Switzerland). *Helv. Chir. Acta* 41 (5/6):603-607, 1974.

1209 ULTRASONIC EXPLORATION OF DILATATION OF THE COMMON BILE DUCT. ITS PLACE IN THE RADIOLOGY OF JAUNDICE: 21 CASES. *(Fr.)* Weill, F.; Bourgoin, A.; Aucant, D.; Eisencher, A.; Faivre, M.; Gillet, M. (Univ. Hosp. Cent., Besancon, France). *Arch. Fr. Mal. App. Dig.* 63(6):453-472, 1975.

1210 DIAGNOSTIC SIGNIFICANCE OF INTRAVENOUS AND INFUSION CHOLANGIOGRAPHY IN BILIARY DISEASES. *(Pol.)* Rzymski, K.; Zwozdziak, L. (Acad. Med., Poznan, Poland). *Wiad. Lek.* 27(7):609-614, 1974.

See also, 1211, 1239, 1251, 1341, 1368, 1418, 1421, 1472, 1483, 1484, 1493, 1524, 1570.

GASTROINTESTINAL DISEASES

ESOPHAGUS

1211 ESOPHAGOSCOPY AS A SOURCE OF PSEUDOMONAS AERUGINOSA SEPSIS IN PATIENTS WITH ACUTE LEUKEMIA: THE NEED FOR STERILIZATION OF ENDOSCOPES. *(E.)* Greene, W. H.; Moody, M.; Hartley, R.; Effman, E.; Aisner, J.; Young, V. M.; Wiernik, P. H. (Natl. Cancer Inst., Baltimore, Md.). *Gastroenterology* 67(5):912-919, 1974.

Culture reports and clinical records of the 12 patients who had undergone endoscopy with a flexible fiberoptic esophagoscope since its purchase in July, 1972 were reviewed to determine if this procedure could be a source of hospital-acquired infection. This review was occasioned by the appearance of *Pseudomonas aeruginosa* sepsis shortly after esophagoscopy in 1 of the patients. Among the 12 patients reviewed, only 3, all with acute leukemia, actually had cultures of esophageal washings (4 times) or tissue (2 times). In each instance, *P. aeruginosa*, of either serotype 5 or 7, was recovered, representing, on 5 of 6 occasions, either the first isolate of any *P. aeruginosa* or the first isolate of that particular serotype recovered from the patient after a minimum of 1 month of culturing. Esophageal mucosal biopsy was performed at the time of endoscopy in 2 of 3 leukemia patients. Each was severely granulocytopenic and in both patients fatal pseudomonas septicemia followed endoscopy, 12 hr and 3 days later. The absence of septicemia in the third patient may be related to a lesser degree of granulocytopenia, the absence of esophageal pathology, and/or to the failure to penetrate the mucosa for biopsy. Cultures of the esophagoscope and of the endoscopy room revealed widespread contamination by enteric organisms, including *P. aeruginosa*; routine handling of the instrument did not correspond to aseptic techniques. It is concluded that endoscopy, particularly with biopsy, in the compromised host carries the dual risk of inducing sepsis from endogenous flora and of introducing invasive nosocomial organisms, especially *P. aeruginosa*. It is recommended that among endoscopy subjects with a significant degree of compromise of host defenses, especially granulocytopenia, sterile precautions, including sterile water, bowls, sterile draping of surfaces, and effective decontamination of the instrument, be employed.

1212 INTRALUMINAL ESOPHAGEAL REWARMING IN NORMALS AND IN PATIENTS WITH CONNECTIVE TISSUE DISEASE. *(E.)* Harell, G. S.; Gold, J. A.; Fries, J. F.; Bradley, B.; Zboralske, F. F. (Stanford Univ. Sch. Med., Calif.). *Invest. Radiol.* 9(3):186-192, 1974.

To determine esophageal involvement in patients with connective tissue disorders, intraluminal esophageal rewarming curves were obtained after ingestion of a bolus of 0.5 C water while the subjects were seated upright. Thermistors were inserted through the nose into the proximal and distal esophagus of 15 normal controls, 4 patients with scleroderma, 3 with systemic lupus erythematosus, 1 with mixed connective tissue disorder, and 2 with Raynaud's disease. The measurement time, T 1/2, required for a thermistor to record a temperature half-way between the minimum temperature reached after ice water ingestion and the baseline temperature was determined for each swallow. Semilogarithmic intraluminal rewarming graphs from both groups had 1 or more straight line segments, indicating that the resistors rewarmed exponentially. There was a significant prolongation of the distal T 1/2 when the patient group (as a whole) was compared with the controls. The results indicate that the ice water remains in the distal esophagus of the patient longer because of abnormal esophageal motility. There was no pooling in the proximal esophagus. Following propantheline bromide injection in 2 controls, the distal 2/3 of the esophagus was moderately dilated, amotile, and had significant fluid retention. Pooling (and subsequent increased T 1/2) in the patient group may occur due to loss of peristalsis in the distal esophagus. Esophageal dilatation alone is probably not a cause of prolonged distal T 1/2. An alteration in esophageal blood flow is associated with the smoot muscle atrophy and motility disorder found in systemi sclerosis. These studies suggest that intraluminal rewarming curves are an indication of esophageal involvement in connective tissue disorders. The data do not support or refute the hypothesis that motility disorders are due to altered esophageal blood flow.

1213 UNRESECTABLE CARCINOMA OF THE OESOPHAGUS. *(E.)* Ong, G. B. (Dep. Surg., Univ. Hong Kong). *Ann. R. Coll. Surg. Engl.* 56(1):3-14, 1975.

1214 MALLORY-WEISS SYNDROME. *(E.)* Wychulis, A. R.; Sasso, A. (St. Michael's Med. Cent., Newark, N.J.). *Arch. Surg.* 107(6):868-871, 1973.

See also, 1125, 1156, 1157, 1158, 1159, 1534, 1545.

STOMACH

1215 EFFECT OF JEJUNAL INTERPOSITION ON ALCOHOL ABSORPTION FOLLOWING SUBTOTAL GASTRECTOMY. *(E.)* Rahbar, A.; Mendoza, Jr., C. B.; Zimmermann, B. (West Virginia Univ. Sch. Med., Morgantown). *Am. Sur* 40(12):702-703, 1974.

e effect of jejunal interposition on absorption of
cohol was studied in gastrectomized dogs. Four
oups of dogs were used: group 1 served as controls
thout operation; group 2, 75% gastrectomy with Bill-
th II reconstruction; group 3, same as group 2 plus
terposition of a segment of jejunum about 25 cm in
ngth between the gastric remnant and the duodenum;
oup 4, isolated jejunal pouch 25 cm in length.
ch animal received 1 ml of 25% ethanol/lb. This
s delivered *via* stomach tube in groups 1, 2, and
and *via* the stoma of the jejunal pouch in group
Blood alcohol levels in normal and gastrectomized
gs were not significantly different. Dogs with the
terposed jejunal segment showed a statistically
gnificant decrease in blood alcohol levels com-
red with normal and gastrectomized dogs of 50, 66,
d 65 mg/100 ml after 30 min, resp. Dogs with the
olated jejunum showed even greater decreases in
ood alcohol levels (36 mg/100 ml at 30 min) with a
owly rising curve. Thus it is concluded that the
terposition of 25 cm of jejunum between the gastric
mnant and duodenum decreases the blood alcohol le-
ls after ingestion. However, it is felt that pa-
ents who have undergone gastric operation should
ill be warned of a possible change in tolerance to
cohol consumption.

16 ISOLATED GASTRIC PNEUMATOSIS. *(E.)* Holgersen, L. O.; Borns, P. F.; Srouji, M. N.
hild. Hosp. Philadelphia, Pa.). *J. Pediatr. Surg.*
6):813-816, 1974.

ur recent cases of isolated gastric pneumatosis
males and 1 female, aged 7 days to 11 weeks) are
esented. Three patients had pyloric stenosis with
matemesis present in 2, and coffee-ground vomitus
ggestive of blood in the third. The 4th patient,
2400 g boy delivered of a pre-eclamptic primapara
ther, experienced laryngospasm, apnea, poor tone,
d depressed reflexes requiring resuscitation.
rly feeding caused distention, particularly in the
ft upper quadrant. A nasogastric tube brought up
large amount of air and brownish material mixed
with blood. Plain films of the abdomen at 4 days of age showed a dilated stomach with gastric-wall air, and diminished air in the remainder of the gastrointestinal tract. Upper gastrointestinal series showed no passage of barium from the stomach after 6 hr. At operation the appearance of the gastric wall and pylorus were normal and a gastrostomy was performed. The time between symptoms and the radiographic documentation of air in the gastric wall of these patients varied from 3 to 30 days. The distribution of air within the stomach wall was relatively symmetrical, but the fundus contained a greater amount of air in 3 of the patients. One patient had the additional finding of free intraperitoneal air, although no signs of peritonitis were present. The gastric pneumatosis disappeared radiographically 2-7 days after gastric decompression. None of these 4 patients was seriously ill, and all had a smooth clinical course with survival. They had in common the presence of increased intragastric pressure and gastric outlet obstruction, 3 mechanical and 1 functional. The increased intragastric pressure was involved in the mechanism of the formation of air in the gastric wall, and a mucosal tear with submucosal dissection of the air might explain the association of gastric pneumatosis with increased intragastric pressure. This view is supported by the prompt resolution of the pneumatosis following gastric decompression.

1217 MALLORY WEISS SYNDROME--DIAGNOSIS AND TREATMENT. *(E.)* Jensen, S. L.; Pagel, J.; Nielsen, O. V. (Rigshosp., Univ. Copenhagen, Denmark). *Scand. J. Gastroenterol.* 9(29):14, 1974.

See also, 1135, 1156, 1157, 1158, 1160, 1161, 1162,
1317, 1452, 1534, 1536, 1545, 1546.

STOMACH

Peptic Ulcers

18 ORAL METIAMIDE AS AN EFFECTIVE INHIBITOR OF GASTRIC ACID SECRETION IN MAN. *(E.)* Bar-
zat, G. O.; Bank, S.; Clain, J.; Novis, B.; Marks,
N. (Groote Schuur Hosp., Cape Town, South Africa).
Afr. Med. J. 48(48):2018-2021, 1974.

e effect or oral metiamide on gastric acid secre-
on stimulated by maximal doses of pentagastrin
μg/kg/hr) was studied in 9 duodenal ulcer patients
ged 20-53 yr). Introduction of metiamide tablets
00 mg, crushed, suspended in 100 ml 0.03 M HCl so-
tion) into the stomach *via* a nasogastric tube,
used significant reductions in basal and pentagas-
in stimulated volume output and acid concentration.
ximal acid output and peak acid output were re-
ced by 51.8% and 51% resp., a highly significant
hibition of gastric acid secretion. This repre-
sents the effect of the drug 2-3 hr after entering the stomach *via* p.o. administration. Metiamide is well absorbed from the gastrointestinal tract and there were no side-effects noted with the 200 mg dose level. These results indicate that metiamide is highly effective in reducing pentagastrin stimulated gastric acid secretion when taken orally.

1219 A COMPARISON OF GASTRIC EMPTYING AT 3 AND 12 MONTHS AFTER PROXIMAL GASTRIC OR SELECTIVE VAGOTOMY WITHOUT PYLOROPLASTY. *(E.)* Donovan, I. A.; Clarke, R. J.; Gunn, I. F.; Alexander-Williams, J. (Gen. Hosp., Birmingham, England). *Br. J. Surg.* 61(11):889-892, 1974.

A prospective study was performed to determine whether the early postoperative disturbance of gastric emptying after vagotomy changed with the passage of time. In 20 patients the rate of emptying of 750 ml of a 10% dextrose meal was measured by a double sampling dye dilution technique before and 3 months after proximal gastric vagotomy or selective vagotomy without a drainage procedure. Ten of these patients agreed to a further emptying study at 12 months after operation. Profound changes in the pattern of emptying occurred as a result of either operation. The first measurement of gastric volume, made 10 min after the meal, showed that gastric incontinence is no more pronounced after selective vagotomy than after proximal gastric vagotomy. In neither group of patients did the volume emptied at 10 min change between 3 and 12 months after operation, suggesting that it is unlikely that any improvement in the gastric incontinence will occur. After this initial phase of incontinence, the emptying of the remainder of the meal, probably a result of antral muscular action, showed no significant change at 3 or 12 months in patients receiving proximal gastric vagotomy. However, selective vagotomy patients, in whom the antral musculature is denervated, showed an impairment of the ability of the stomach to empty actively as reflected in the prolonged total emptying time. The fact that at 12 months after operation this increase in total emptying time had lessened in some patients suggests that the muscular action of the denervated antrum may recover to some extent with time.

1220 GASTRIN RESPONSE TO FOOD IN DUODENAL ULCER PATIENTS BEFORE AND AFTER SELECTIVE OR HIGHLY SELECTIVE VAGOTOMY.

(E.) Stadil, F.; Rehfeld, J. F.; Christiansen, P. M.; Kronborg, O. (Rigshosp., Copenhagen, Denmark). *Br. J. Surg.* 61(11):884-888, 1974.

The role of the vagus in the gastrin response to a steak meal was investigated in 61 duodenal ulcer patients. Thirty patients (23 males and 7 females, mean age 46 yr) were studied before and 2 weeks after selective vagotomy with a Weinberg pyloroplasty. Basal and stimulated gastrin concentrations in serum, as determined by radioimmunoassay, were higher postoperatively (87 pre-operatively/111 postoperatively for basal and 243/341 for peak, pg/ml). Another group of 30 patients (21 males and 9 females, mean age 48 yr) were studied before and after highly selective vagotomy without drainage. Basal and stimulated gastrin concentrations were also higher postoperatively in these patients (94/133 and 277/343 pg/ml, resp.). The differences between the two groups of patients were insignificant. Between individual cases, gastrin responses varied markedly, but pre- and postoperative responses were positively related within the same patient. No differences were noted between patients with positive or negative Hollander responses to insulin. In 6 patients, 1 after highly selective vagotomy and 5 after selective vagotomy, studied 2 and 14 weeks postoperatively, no difference was apparent. Thus it is concluded that antral branches of the vagi play only a minor role, if any, in the gastrin response to food.

1221 NEUROLOGICAL SYMPTOMS AND SIGNS IN A SELECTED GROUP OF PARTIALLY GASTRECTOMIZED PATIENTS WITH PARTICULAR REFERENCE TO B_{12} DEFICIENCY.

(E.) Roos, D. (Dep. Neurol., Univ. Copenhagen, Denmark). *Acta Neurol. Scand.* 50(6):719-752, 1974.

The neurological manifestations observed in 42 partially gastrectomized patients (9 women and 33 men, mean age 56.5 yr) with serum B_{12} levels below 200 pg/ml were investigated. A Billroth I operation had been performed in 8 patients, a Billroth II in 30. In 4 cases the operation consisted of pyloroplasty plus total vagotomy. Of these 42 patients, 17 were anemic, including 6 with reduced serum iron, sometimes accompanied by a high serum transferrin. Only 6 showed the classical appearance of megaloblastic bone marrow. Relevant descriptions of sensory or motor symptoms after operation were given by 31 patients. Clinical neurological examination revealed abnormal neurological signs in 35 (83%), presumably due to B_{12} deficiency. Generally, the somato-neurological symptoms were modest, overshadowed by severe gastrointestinal symptoms or by emotional and intellectual impairment. Thirty patients complained of constant dyspeptic symptoms, paresthesia (24), hypoesthesia and dysesthesia (12), pain (3), dizzines (16), disturbances of coordination (7), and localize weakness (3). A surprisingly large number of patients having serum B_{12} below 200 pg/ml were impotent, 11 of the 33 men. In 1 patient this was combined with urinary incontinence. Serum B_{12} averaged 142 pg/ml in these 11 patients. The dyspeptic symptoms could be grouped into the afferent loop syndrome, the small stomach syndrome and dumping. Vomiting of bile did not occur. Pain related to meals was noted in 27 patients. Dumping was present in 22, 20 of whom also suffered from the small stomach syndrome. Twenty-three suffered from diarrhea, often imperious and often provoked by meals. In 15 of 23 patients the stools were loose and fatty. Thirty-three patients continued with injections of vitamin B_{12}. Twenty-six of them reported subjective improvement, especially regarding peripheral extremity symptoms. Eighteen also experienced objective improvement. Considering the serious and gradually irreversible mental and neurological defects that vitamin B_{12} deficiency can entail, vitamin B_{12} therapy of a partially gastrectomized patient with a low serum B_{12} level is the only correct solution.

1222 NEUROLOGICAL COMPLICATIONS IN AN UNSELECTE GROUP OF PATIENTS PARTIALLY GASTRECTOMIZED FOR GASTRIC ULCER.

(E.) Roos, D. (Bispebjerg Hosp., Copenhagen, Denmark). *Acta Neurol. Scand.* 50(6): 753-773, 1974.

A clinical neurological follow-up study was conducte on 128 patients with a history of surgery for benign gastric ulcer an average of 12 yr previously. At operation 127 patients had a gastric ulcer situated in the corpus (92) or antrum (37) cases; 2 patients had ulcers in both sites. One patient had severe gastroduodenitis. Duodenal ulcer was also present in 23 patients. In 32 cases the primary surgery was a Billroth I and in 92 cases, a Billroth II. In 2 cases the Billroth I was later converted to a II. T e range at operation was from 29 to over 50 yr. At llow-up there were 42 females and 86 males, aged -90 yr. Neurological symptoms present at follow-up cluded dizziness (39 patients), paraesthesiae in es and fingers (54), nocturnal cramps in calves), piercing, deep, often nocturnal pain in upper lower limbs (5), hypoesthesia, anesthesia, or dys- thesia (24), localized weakness (12), uncoordina- on (5), loss of potency (5), and visual impairment). Among these 128 patients, 44 had signs of mye- pathy, peripheral neuropathy or severe intellectual pairment, presumably due to vitamin B_{12} deficiency. vere intellectual impairment was found in 10 of 29 tients with serum B_{12} levels below 150 pg/ml. Four these 44 patients were on vitamin B_{12} therapy. In e remaining 40 the serum vitamin B_{12} averaged 154 /ml. Out of the 44 affected patients 14 were in the serum B_{12} range 150-200 pg/ml. B_{12} therapy is recommended also for this group of "questionable reduction" in order to avoid irreversible cerebral and spinal lesions due to the B_{12} deficiency.

1223 HIGHLY SELECTIVE VAGOTOMY IN THE TREATMENT OF DUODENAL ULCER. *(Fr.)* Imperati, L.; Marinaccio, F.; Altieri, A. (Reg. Hosp., Foggia, Italy). *Nouv. Presse Med.* 24(29):1811-1813, 1974.

See also, 0860, 0872, 1156, 1157, 1163, 1164, 1174, 1440, 1451, 1471.

SMALL INTESTINE

24 NEUROGENIC TUMORS OF THE SMALL INTESTINE. REVIEW OF THE LITERATURE AND REPORT OF A SE WITH ENDOSCOPIC REMOVAL. *(E.)* Sivak, Jr., V.; Sullivan, Jr., B. H.; Farmer, R. G. (Cleve- nd Clin. Found., Ohio). *Gastroenterology* 68(2): 4-380, 1975.

igastric pain and melena prompted the study of a -yr-old woman with cutaneous neurofibromatosis, n Recklinghausen's disease. Roentgenographic and doscopic examination demonstrated an ulcerated lypoid neurilemoma of the duodenum. It was re- ved by endoscopic electrosurgery. This is the rst report of the endoscopic management of bleed- g related to these tumors. Neurogenic small bowel mors, while rare, must be considered in the dif- rential diagnosis of gastrointestinal bleeding ich has been localized to the small intestine by andard diagnostic measures or is of uncertain ori- n. Endoscopic polypectomy with electrocoagulation an ulcerated tumor is proposed as a relatively fe measure for those lesions within the range of e instrument. If the procedure is not effective, parotomy may be required.

25 ANTIPERISTALTIC SEGMENTS FOR THE TREATMENT OF SHORT BOWEL SYNDROME. *(E.)* Pertsemlidis, D.; ark, A. E. (Mt. Sinai Sch. Med., City Univ. New York, .Y.). *Am. J. Gastroenterol.* 62(6):526-530, 1974.

e successful use of an antiperistaltic small bowel gment is demonstrated in a 33-yr-old woman with capacitating fluid and electrolyte imbalance due excessive jejunostomy losses. Two years prior to r current admission, she had been operated on for leocolitis. The operation consisted of distal ile- ctomy (about 50 cm), subtotal colectomy and ileo- igmoidostomy. The tentative pathological diagnosis as "ulcerative colitis". Complications required second operation 14 months later at which time the leosigmoidostomy was taken down, 85 cm of diseased leum was resected, a jejunostomy was constructed nd the lower sigmoid was brought out through a sepa- ate cutaneous exit (mucous fistula). Pathological diagnosis was changed to granulomatous ileocolitis (Crohn's disease). Radiographic examinations indicated that 120-150 cm of jejunum were left between the ligament of Treitz and the jejunal stoma. The intestinal transit time using barium meal was estimated to be 10 min, even though the remaining small bowel was free of disease. Uncontrollable water and electrolyte imbalance necessitated the creation of an antiperistaltic jejunal segment. A 14 cm segment was reversed, located about 12-15 cm from the jejunostomy, by the method of Rygick and Nasarov which permits the reversal of the segment without twisting the mesentery. On recovery she was able to maintain adequate fluid balance and to ingest solid food diet without excessive losses through jejunostomy. In the past 2 years she has remained well. Intermittent mild azotemia is corrected by increasing the oral fluid intake. It is suggested that the remaining 120-150 cm of normal jejunum would have been adequate for this patient had the colon been intact. The site for creating a reversed loop should be as distal in the small bowel as possible. However, the choice of the site for a reversed loop is dictated by biochemical rather than mechanical criteria.

1226 FAMILIAL MECONIUM ILEUS NOT ASSOCIATED WITH CYSTIC FIBROSIS. *(E.)* Dolan, Jr., T. F.; Touloukian, R. J. (Yale Univ. Sch. Med., New Haven, Conn.). *J. Pediatr. Surg.* 9(6):821-824, 1974.

The occurrence of meconium ileus is reported in 2 full-term male siblings. The mother had had an intestinal obstruction of unknown cause at 1 yr of age requiring surgery. In neither of these two cases was a characteristic meconium plug seen at operation or delivered by Gastrografin enema. Both children are now receiving regular diets and have normal growth and development without gastrointestinal or pulmonary problems. There is no suggestion of Hirschsprung's disease. The explanation for meconium obstruction in these patients is not known. Protein analysis of the meconium was not performed. It is felt that this may be the first report of familial meconium ileus without associated cystic fibrosis of the pancreas or pancreatic insufficiency. These children supply proof that not all patients with meconium ileus will eventually prove to have cystic fibrosis. Definitive parental counseling should be delayed until an accurate sweat test can be performed, usually not possible until the infant is about 3-4 weeks of age.

1227 VASODILATORY DRUGS IN THE MANAGEMENT OF NONOCCLUSIVE BOWEL ISCHEMIA. *(E.)*

Athanasoulis, C. A.; Wittenberg, J.; Bernstein, R.; Williams, L. F. (Boston City Hosp., Mass.). *Gastroenterology* 68(1):146-150, 1975.

A 75-yr-old female was hospitalized because of an acute myocardial infarction. An electrocardiogram showed marked digitalis toxicity with occasional premature ventricular contraction. On the 10th day, abdominal pain and rising temperature were apparent. An abdominal radiograph showed distention of the small and large bowel with thickening of the small bowel wall, suggesting bowel ischemia. After the diagnosis of nonocclusive mesenteric ischemia was firm, papaverine (0.4 mg/kg, or 30.0 mg) was rapidly injected as a bolus through the angiographic catheter into the superior mesenteric artery followed by papaverine infusion (0.8 mg/kg/hr) for 1 hr. Papaverine showed minimal dilation of jejunal arterial branches. Phenoxybenzamine (0.2 mg/kg) was injected as a bolus into the superior mesenteric artery followed by an infusion at a rate of 0.7 mg/kg/hr for 1 hr. Phenoxybenzamine showed reversal of the vasoconstriction with marked dilation of the superior mesenteric artery and all its branches. After 11 hr, phenoxybenzamine was again infused (0.7 mg/kg/hr). After 1 hr no effect on the size of the middle colic artery was noted. An emergency upper gastrointestinal series showed normal stomach and duodenum with distention of the proximal small bowel. At 18 hr after the initial infusion, the patient's condition was unchanged and the stool became guaiac-positive. At exploratory laparotomy a double barrel transverse colostomy was created. The patient recovered and, when released on the 46th hospital day, had no signs of nutritional difficulties. This approach of using resuscitative measures and delaying operative intervention in such cases, decreases the extent of small bowel resection and should also decrease the incidence of anastomotic leaks which complicate early resections. Operative intervention is still necessary as many of these patients do have full wall necrosis of a bowel segment and the nonoperative diagnosis of nonocclusive mesenteric ischemia remains one of presumption. The advantage in using papaverine is the lack of systemic effects at infusion rates of 1 mg/min for several hr or days. The disadvantage is that several hr are required before papaverine achieves its major effect. Thus it is concluded that a patient with the clinical, angiographic, operative, and pathological diagnosis of nonocclusive mesenteric ischemia can respond to direct superior mesenteric artery infusion of vasodilatory drugs.

1228 GASTROINTESTINAL HEMORRHAGE -- AN UNUSUAL MANIFESTATION OF NEUROFIBROMATOSIS. *(E.)*

Devereux, R. B.; Koblenz, L. W.; Cipriano, P.; Gray, G. F. (New York Hosp., N.Y.). *Am. J. Med.* 58(1): 135-138, 1974.

A 29-yr-old Puerto Rican male presented with a 4 day history of melena, pregressive weakness and vomiting of bilious gastric contents. He had had multiple subcutaneous nodules and cafe au lait spots all his life. For 10 years prior to admission he experience epigastric pain almost daily, which progressively worsened in the weeks before bleeding commenced. An x-ray series of the upper gastrointestinal tract and small bowel revealed only a small hiatus hernia. Superior mesenteric and inferior mesenteric arteriography disclosed a vascular tumor in the jejunum. Surgery demonstrated a single dumbbell-shaped intramural tumor which appeared to arise within the muscularis of the jejunum. About half the lesion protruded into the serosa whereas the other half compressed the lumen with attenuation of the mucosa in which there was a shallow erosion 3 mm in diameter. Microscopically the leiomyoma consisted of whorls of spindly cells with uniform nuclei without pleomorphism or mitotic figures. The appearance closely resembled that of intestinal smooth muscle. Epithelioid cell granulomas with giant cells, some containin fragments of *Schistosoma* eggs, were within the tumor. Similar granulomas were also in the intestinal mucosa. The patient remains well 1 yr after recovery, free of abdominal complaints. A small intestinal tumor must be highly suspect as the source of bleeding in any patient with neurofibromatosis, gastrointestinal hemorrhage, and a negative nasogastric aspirate. Arteriography should be the contrast procedure of first choice. Definitive resection should be undertaken in view of the frequency of recurrent life-threatening hemorrhage.

1229 AORTODUODENAL FISTULA: COMPLICATION OF RENAL ARTERY BYPASS GRAFT. *(E.)*

Keeffe, E. B.; Krippaehne, W. W.; Rosch, J.; Melnyk, C. S. (Univ. Oregon Med. Sch., Portland). *Gastroenterology* 67(6):1240-1244, 1974.

A 35-yr-old female developed postpartum arterial hypertension. Angiography showed advanced medial fibromuscular hyperplasia of the right renal artery. This was treated with a Dacron bypass graft. The following year hypertension reappeared and graft occlusion was noted. The graft was shortened and repaired. Recurrent clotting in the graft 2 years later led to placement of a second bypass graft off the aorta. Hypertension returned and was managed medically. Three years later angiography demonstrated advanced medial hyperplasia of the right renal artery and occlusion of the second graft. The following year found medical management of her hypertension impossible, and surgical autotransplantation of her right kidney to the left iliac fossa was performed at which time the occluded second graft was ligated and left attached to the aorta as had been done with the first graft. At age 44 she was admitted for gastrointestinal bleeding. Over the next 2 months she was readmitted 3 additional times for gastrointestinal bleeding, and 10 days after her final admission she collapsed in shock from massive gastrointestinal bleeding and died during emergency surgery. During this surgery an aortoduodenal fistula was discovered. This may be the first reported case of a fistula developing from the proximal anastomosis of renal bypass graft surgery. An aortointestinal fistula should be considered as a cause of gastrointestinal hemorrhage in patients with a history of renal artery bypass graft placement or any other arterial reconstructive surgery in proximity to the gastrointestinal tract. Prompt surgical exploration in the clinical setting of aneurysm, or former arterial or aortic vascular surgery, remains the best approach to diagnosis as well as therapy.

1230 PRIMARY CARCINOMA OF SMALL INTESTINE. *(Pol.)* Borowski, Z. (F. Krzystalowicz Dist. Hosp., Olkusz, Poland). *Wiad. Lek.* 27(11): 1037-1041, 1974.

1231 DUODENECTOMY IN CANCER OF DUODENUM AND THE MAJOR DUODENAL PAPILLA. *(Rus.)* Futoryan, E. S.; Shubin, B. M. (P. A. Gertsen Res. Inst. Oncol., Moscow, USSR). *Khirurgiia (Mosk.)* (1):69-72, 1974.

1232 DUODENAL LIPOMA. *(Fr.)* Suire, P.; Gousse, C. (no affil.). *J. Chir. (Paris)* 107(2): 177-188, 1974.

1233 BENIGN DUODENAL TUMORS: RADIOLOGICAL AND ENDOSCOPIC COMPARISONS. *(Fr.)* Barbier, J. P. (Laennec Hosp., Paris, France). *Sem. Hop. Paris* 50(25):1683-1689, 1974.

1234 MECKEL'S DIVERTICULUM AND ITS BLOOD SUPPLY. *(Rus.)* Starshun, G. A. (Dep. Pathol. Anat., S. M. Kirov Metall. Works, Makeenka, USSR). *Arkh. Anat. Gistol. Embriol.* 67(10):86-90, 1974.

1235 CLINICAL ASPECTS OF DIVERTICULA OF THE SMALL INTESTINE WITH THE EXCEPTION OF MECKEL'S DIVERTICULUM. *(It.)* Tagliaferri, G.; Cuccu, P.; Perozzi, A.; Preziosi, M. (S. Spirito Hosp., Sassia, Italy). *Chir. Gastroenterol.* 8(2): 214-227, 1974.

1236 INTRALUMINAL DUODENAL DIVERTICULUM: REPORT OF 2 CASES. *(Fr.)* Bories-Azeau, A.; Cabanettes, L.; Godlewski, G.; Dayan, L.; Vallat, C.; Peraldi, R. (St. Eloi Hosp., Montpellier, France). *J. Chir. (Paris)* 107(4):421-434, 1974.

1237 POSTOPERATIVE EXTERNAL DUODENAL FISTULAS. *(Rus.)* Popandopulo, G. D.; Ivaneko, S. D. (A. M. Gorky Med. Inst., Donetsk, USSR). *Vestn. Khir.* 113(9):119-124, 1974.

1238 EXTERNAL FISTULAS OF THE SMALL INTESTINE. *(Pol.)* Gacyk, W.; Dybicki, J. (Acad. Med., Gdansk, Poland). *Wiad. Lek.* 27(11):1031-1035, 1974.

1239 CLINICAL AND RADIOLOGICAL CORRELATIONS IN ACUTE OBSTRUCTION OF THE SMALL INTESTINE DUE TO STRANGULATION. *(Rus.)* Shcherbatenko, M. K.; Umanskaia, V. S. (N. V. Sklifosovskii Inst. Emerg. Med. Treat., Moscow, USSR). *Khirugiia (Mosk.)* (2): 48-52, 1974.

1240 OBSTRUCTION OF THE SMALL INTESTINE CAUSED BY A GALLSTONE. *(Pol.)* Czekalski, K.; Taniewski, W.; Przepiorski, J. (Munic. Hosp. Emerg. Surg., Warsaw, Poland). *Wiad. Lek.* 27(6):547-550, 1974.

1241 RECURRENT ILEUS DUE TO DEVELOPMENTAL ANOMALY OF THE INTESTINE. *(Pol.)* Chrzanowska, M.; Iliew, G.; Kowalski, T.; Mszanecki, J. (Dist. Hosp., Kamienna Gora, Poland). *Wiad. Lek.* 27(5): 443-445, 1974.

1242 RETROPERITONEAL RUPTURE OF THE DUODENUM. *(It.)* Interlandi, G. (Gen. Prov. Hosp., Bassano del Grappa, Italy). *Chir. Gastroenterol.* 8(1):92-103, 1974.

1243 ACUTE POSTOPERATIVE PERFORATION OF THE SMALL INTESTINE. *(It.)* Perelli, L.; Pugno, V.; Ardito, G.; Mantovani, M. (Inst. Spec. Surg. Pathol., Sacred Heart Cathol. Univ., Rome, Italy). *Policlinico* [*Chir.*] 81(2):61-68, 1974.

1244 DIAGNOSTIC AND THERAPEUTIC PROBLEMS OF TRAUMATIC PERFORATION OF THE DUODENUM IN CHILDREN. *(Ger.)* Schmidt, H. D.; Hofmann, S. (Surg. Clin., Univ. Mainz, Germany). *Bruns Beitr. Klin. Chir.* 221(5):370-378, 1974.

1245 MEGADUODENUM. A CASE REPORT AND LITERATURE REVIEW. *(E.)* Anderson, F. H. (Dep. Med., Univ. British Columbia, Vancouver, Canada). *Am. J. Gastroenterol.* 62(6):509-515, 1974.

1246 ROENTGENOCINEMATOGRAPHY DEMONSTRATING THE EFFECT OF SURGICAL SLOW-DOWN OF SMALL BOWEL TRANSIT: ANASTOMOSIS, TRANSPOSITION OF THE SMALL INTESTINE, MYOTOMY. *(Ger.)* Dux, A.; Lenz, H.; Blomer, A.; Hofer-Janker, H. (Mariahilf Hosp., Monchengladbach, Germany). *Radiologe* 14(9):409-414, 1974.

1247 THE INFLUENCE OF CORTISONE ON THE HEALING OF EXPERIMENTAL INTESTINAL ANASTOMOSES. *(Rus.)* Silvestrov, V. S. (Dep. Gen. Surg., Petrozanodsk Univ., USSR). *Eksp. Khir. Anesteziol.* (5):46-48, 1974.

1248 CLINICAL TRIALS OF SODIUM LEVORIN TABLETS SOLUBLE IN THE INTESTINE. *(Rus.)* Ashbel, S. I.; Boboslovskaia, I. A.; Khil, R. G.; Sokolova, V. G.; Filiushina, Z. G. (Gorky Res. Inst. Ind. Med. Occup. Hyg., USSR). *Antibiotiki* 19(7):645-648, 1974.

SMALL INTESTINE

1249 DETERMINING THE LENGTH OF THE INTESTINE IN LIVING HUMAN SUBJECTS AND EXPERIMENTAL ANIMALS. *(Rus.)* Komarov, I. A.; Mokhov, E. M. (Kalinin Med. Inst., USSR). *Eksp. Khir. Anesteziol.* (6):35-38, 1974.

See also, 1114, 1136, 1137, 1165, 1166, 1167, 1168, 1169, 1170, 1171, 1270, 1274, 1305, 1306, 1307, 1336, 1476, 1511, 1518, 1526, 1536, 1546, 1547, 1555, 1562, 1595.

SMALL INTESTINE

Malabsorption

1250 NEGLECTED COELIAC DISEASE. *(E.)* McCrae, W. M.; Eastwood, M. A.; Martin, M. R.; Sircus, W. (R. Hosp. Sick Child., Edinburgh, Scotland). *Lancet* 1(7900):187-190, 1975.

One hundred and two patients in which celiac disease had been diagnosed during childhood agreed to a follow-up study. Only 2 of these patients had continued on a gluten-free diet without interruption since diagnosis. In both cases the jejunal biopsy was normal. The other 100 patients had all been eating gluten regularly and in quantity for at least one year before review. During review 55 cases of persisting celiac disease were discovered. Of these 55, 40 had stopped treatment in the mistaken belief that they had recovered from an illness which they understood to be temporary. The remaining 15 were aware of the continuing nature of the disorder, but were unable to maintain treatment without continuing dietetic advice. Symptoms in this group with continuing disease were not prominent. A few complained of lassitude, abdominal discomfort, or occasional diarrhea, but the symptoms were not compelling. Only 2 patients sought medical advice and they felt they had recovered after being treated for anemia. Clearly, untreated celiac disease had affected the growth of these patients. As a group, the 55 were significantly smaller than the normal population. Their weights were related normally to their heights and thus gave no indication of continuing malabsorption. Serum proteins and magnesium were entirely normal. No case of rickets or osteomalacia was found. The frequency of anemia was high. The findings of this study indicate that most cases of untreated celiac disease continue undetected and perhaps undetectable unless a jejunal biopsy is performed. The size of the total population, now regarded as having a pre-malignant condition, is unknown, but assumed to be large. This study also indicates that where the patients are not followed up and given continuing dietetic advice, effective treatment of celiac disease is not maintained.

1251 LIMITATIONS OF XYLOSE TOLERANCE TEST AS A SCREENING PROCEDURE IN CHILDHOOD COELIAC DISEASE. *(E.)* Lamabadusuriya, S. P.; Packer, S.; Harries, J. T. (Hosp. Sick Child., London, England). *Arch. Dis. Child.* 50(1):34-39, 1975.

The ability of the xylose tolerance test to serve as a screening procedure for celiac disease was reexamined in 54 children (aged 4 months through 16.4 yr) with suspected celiac disease. Five- and 24-hr urinary excretion rates of xylose were of no value in discriminating between patients with and without celiac disease. The 3-hr blood xylose concentration was likewise non-discriminatory. Three of the patients with subtotal villous atrophy (15.8%) and 8 of those with partial villous atrophy (61.5%) due to celiac disease had 1-hr blood xylose values which fell in the normal range. Withdrawal or reintroduction of dietary gluten caused variable effects on sequential 1-hr blood xylose levels. Thus, such manipulations of dietary gluten was generally not helpful in predicting those patients who would develop gluten-induced mucosal changes. Serious limitations of the xylose tolerance test as a screening procedure in childhood celiac disease were exposed by this study. It is suggested that the use of the urinary xylose test be abandoned in the pediatric population. The finding of a normal 1-hr blood xylose value clearly does not exclude a diagnosis of celiac disease even in young children who have never received a gluten-free diet. A clinical suspicion of celiac disease remains the most important single factor in deciding whether to perform a jejunal biopsy.

1252 COELIAC DISEASE DURING THE TEENAGE PERIOD: THE VALUE OF SERIAL SERUM FOLATE ESTIMATIONS. *(E.)* Weir, D. G.; Hourihane, D. O. (Sir Patrick Dun's Hosp., Dublin, Ireland). *Gut* 15(6): 450-457, 1974.

A group of 23 teenage celiac patients was followed at 3-month intervals as outpatients to assess their progress and monitor their ability to maintain a gluten-free diet. After a follow-up period of 4 to 6 yr, a detailed reassessment was made in the hospital on 10 patients, only 5 of whom had persevered with a gluten-free diet. There was no appreciable difference between the 2 groups in regard to physical development, height, or weight during the observation period. The jejunal mucosal histology of those patients who did not persist with a gluten-free diet remained flat although these patients appeared to have clinical remission. Those subjects who did persist with a gluten-free diet regime had a normal or near normal mucosal histology. Measurement of total proteins, serum albumin, calcium, phosphate and vitamin B_{12} showed no significant change when the patients were compared. No significant differences existed in the D-xylose or fecal fat absorption tests. The hemoglobin, corpuscular hemoglobin, and alkaline phosphatase concentrations did not significantly differ between the groups. The serum iron and folate levels were not significantly different at the beginning of the study, however, at the end of the hospitalized follow-up period, these ere the only parameters which separated the 2 groups ignificantly. The serum iron values were 91.4 and 3.2 mg%, and the serum folate levels were 8.6 and .0 ng/ml for the gluten-free and the non-gluten-free iet groups, resp. Although the serum iron values eparated the 2 groups as a whole, the individual ariation was such as to make it of limited practical alue. The serum folate levels, on the other hand, part from dividing the 2 groups, seemed to correate reasonably closely with the variation in each ndividuals' dietary regime. The findings of this tudy suggest that the natural history of celiac isease is for clinical remission to occur during arly adult life regardless of dietary control. This emission, however, does not pertain to jejunal muosal histology. The study further demonstrates the mportance of serial serum folate level measurements o determine the clinical progress of the patient nd whether or not the subject is maintaining a luten-free diet.

253 MEASURING THE RESPONSE OF THE JEJUNAL MUCOSA IN ADULT COELIAC DISEASE TO TREATMENT ITH A GLUTEN-FREE DIET. *(E.)* Chapman, B. L.; enry, K.; Paice, F.; Coghill, N. F.; Stewart, J. S. West Middlesex Hosp., Isleworth, England). *Gut* 5(11):870-874, 1974.

rchitectural changes in the small intestinal mucosa ere followed for 4 to 14 months to assess the longerm response in 6 patients with adult celiac diease to treatment with a gluten-free diet. Prior o treatment, each patient had a flat or flat-with-osaic jejunal mucosa and subtotal villous atrophy. ll improved clinically, hematologically, biochemially, and histologically when treated with a gluten-ree diet. Multiple jejunal diverticula were noted n 1 patient, but these were no longer present after months of gluten withdrawal. The study indicated hat the ratio of the areas of surface and crypt pithelium in proximal jejunal biopsies is useful for easuring the long-term mucosal response of patients o the diet. In 4 patients, this area ratio inreased consistently with time on the diet after the irst few weeks. In the remaining 2, the increase as not maintained. No patient achieved complete istological normality during the study. In 1 of he 3 patients followed for a year or more, the area atio increased to within the control range, and in of these 3 the ratio was about 10 times the pre-reatment ratio. Overall there was a highly signiicant linear correlation between the area ratio and he length of time on the diet, and 60% of the variation in the ratio was explained by variation in he time. This correlation was much closer than hat for surface cell height. However, the surface ell height did increase rapidly in the early weeks f treatment, while patients were still in the ward n a strict diet. The early variability of the area atio may be due in part to errors inherent in this ethod of measurement, and in part to asynchronous hanges in the areas of surface and crypt epithelium hen gluten is first withdrawn. Thus, surface cell eight was valuable for measuring the early response o treatment. Area ratio, on the other hand, was uitable for following the response over longer periods of time. It is suggested that the 2 methods of measurement are complementary.

1254 THE TOXICITY OF CERTAIN CEREAL PROTEINS IN COELIAC DISEASE. *(E.)* Cornell, H. J.; Townley, R. R. W. (R. Child. Hosp., Melbourne, Australia). *Gut* 15(11):862-869, 1974.

Gliadins from wheat, rye, and oats and from wheat glutenin were digested with pepsin, trypsin, and pancreatin and the products chromatographed on sulfopropyl Sephadex. Fractions eluted near neutral pH from wheat, rye, and oats gliadin digests all had very similar amino acid composition, although the oats fraction was higher in sulfur-containing amino acids. The major amino acids present in all were glutamine/glutamic acid and proline. The amount of fraction eluted near neutral pH from oats gliadin digest was about 13% of that eluted from digests of wheat and rye gliadins. Moreover, the yield of gliadin from oatmeal was only 0.5% compared with 2.4% and 2.8% from rye and wheat flours, resp. However, even this small amount, thought to be associated with toxicity, suggests that oats should be excluded from a diet regarded as strictly gluten-free. It is possible that there are individuals sensitive even to these low levels of toxic components. The amount of fraction eluted from wheat glutenin digest was about 70% of that obtained from wheat and rye gliadin digests. The fractions eluted near neutral pH from all protein digests were defectively digested by remission celiac mucosa. D-Xylose excretion tests with the fraction from wheat gliadin digest (fraction 9) indicated that it is harmful to subjects with celiac disease. This fraction contained several polypeptides present to the extent of about 8% of the total nitrogen applied to the column, thus providing a link between defective digestion and the toxicity of gluten in celiac disease. Pyrrolidone carboxylyl peptides did not affect D-xylose excretion, thus indicating no deficiency of pyrrolidone carboxylyl peptidase in celiac intestinal mucosa. The finding of defective digestion with counterpart fractions to fraction 9 obtained from wheat glutenin and rye and oats gliadins may be significant in the etiology of celiac disease.

1255 CELIAC DISEASE WITH PRIMARY CUTANEOUS AMYLOIDOSIS. *(E.)* Presbury, D. G. C.; Griffiths, W. A. D. (St. John's Hosp. Dis. Skin, London, England). *Br. J. Dermatol.* 92(1):109-112, 1975.

A 61 yr old man presented with an 8 week history of eczema. During the next 6 months this condition continued and lichenification of the calves was noted. He had started having explosive diarrhea 2-4 times daily, the stools being pale and bulky, soon after the onset of his skin trouble. A jejunal biopsy showed a flat mucosa typical of celiac disease. After beginning a gluten-free diet, his diarrhea stopped at once. His skin gradually improved so that over the next year the hand eczema cleared and he was left with apparent lichenification of the calves. This was made up of discrete, brown, firm, dome-shaped, rough and excoriated papules of the type seen in lichen amyloidosus. A biopsy showed the presence of amyloid in some of the dermal papillae, using congo red, methyl violet and thioflavin-T stains, which confirmed diagnosis of lichen amyloidosus. The patient remains well, but the pruritic areas of lichen amyloidosus have not been changed by topical treatment. There is nothing to suggest that this patient has systemic amyloidosis. The skin changes have never suggested dermatitis herpetiformis, clinically or histologically. There is no obvious cause for the concurrence of the skin changes and celiac disease in this man. It is suggested that this is a first report of a combination of lichen amyloidosus and celiac syndrome.

1256 ANTIRETICULIN ANTIBODIES IN DERMATITIS HERPETIFORMIS AND ADULT COELIAC DISEASE. THEIR RELATIONSHIP TO A GLUTEN FREE DIET AND JEJUNAL HISTOLOGY.

(E.) Lancaster-Smith, M.; Kumar, P.; Clark, M. L.; Marks, R.; Johnson, G. D. (St. Bartholomew's Hosp., Taplow, England). *Br. J. Dermatol.* 92(1):37-42, 1975.

An attempt was made to relate the occurrence of antireticulin antibodies to jejunal mucosal abnormality and the presence of gluten in the diet. Sera from 35 dermatitis herpetiformis patients (26 males and 9 females aged 17-73 yr) and 28 adult celiac disease patients (7 males and 21 females aged 19-71 yr) were examined and compared with sera from 30 normal controls. Antireticulin antibody was increased in prevalence in both dermatitis herpetiformis patients (17%) and adult celiac disease patients (45%) as compared with the control group in which the antibody was not found. In studying the relation of the antibody incidence to a gluten free diet, it is noted that 6 of 32 dermatitis herpetiformis patients on normal diets and 1 of 6 on gluten free diets had the antibody in their sera. Of the adult celiac disease patients, 9 of 12 on normal diets and 6 of 21 on gluten free diets had antireticulin antibody in their sera. Fourteen dermatitis herpetiformis patients had subtotal villous atrophy and 6 of these had the antibody in their sera, compared to only 1 of 19 with partial villous atrophy and none of 5 with a normal mucosa. Of 20 adult celiac disease patients with subtotal villous atrophy, 11 had the antibody, and of 12 with partial villous atrophy, 4 had positive tests. The 1 patient with a normal mucosa did not have this antibody. Two patterns of tissue staining were demonstrated, 1 of which was almost invariably associated with jejunal subtotal villous atrophy. In all 22 positive tests the antireticulin antibody was of the IgG class and in 14 it was also of the IgA class. There was no correlation between the immunoglobulin class of the antibody and whether the patient had dermatitis herpetiformis or adult celiac disease. Similarly there was no correlation with the type of staining pattern, dietary status or the severity of the mucosal lesion. This study confirms the relation in adult celiac disease between the occurrence of antireticulin antibody and the presence of gluten in the diet. It is recommended that screening for antireticulin antibody may be used to detect untreated patients with adult celiac disease and dermatitis herpetiformis patients with subtotal villous atrophy. The test may also aid in monitoring adherence to a gluten free diet.

1257 ASSESSMENT OF JEJUNAL FUNCTION IN PATIENTS WITH DERMATITIS HERPETIFORMIS AND ADULT COELIAC DISEASE USING A PERFUSION TECHNIQUE.

(E.) Kumar, P. J.; Silk, D. B. A.; Rousseau, B.; Pagaltsos, A. S.; Clark, M. L.; Dawson, A. M.; Marks, R. (St. Bartholomew's Hosp., London, England). *Scand. J. Gastroenterol.* 9(8):793-798, 1974.

The jejunum of 12 patients (4 males and 8 females aged 20-60 yr) with untreated adult celiac disease and of 23 patients (18 males and 5 females aged 17-70 yr) with dermatitis herpetiformis with varying morphological abnormalities of the small bowel was perfused with a double lumen tube incorporating a proximal occlusive balloon. Nineteen normal adult volunteers with no evidence of gastrointestinal disease served as controls. Water absorption from a 56 mM solution of glucose was significantly depressed in 7 of 9 patients with adult celiac disease and in 6 of 10 with dermatitis herpetiformis with subtotal villous atrophy; actual secretion was seen in 4 patients in each group. Glucose absorption from this solution was depressed in 5 of 9 with adult celiac disease and in 4 of 10 with dermatitis herpetiformis and subtotal villous atrophy. Abnormalities of absorption were also seen in dermatitis herpetiformis patients with partial villous atrophy and with normal jejunal biopsies. Using a 35 mM saline-bicarbonate solution, bicarbonate absorption was depressed in 2 of 8 with adult celiac disease, 2 of 11 with dermatitis herpetiformis and subtotal villous atrophy, 1 of 5 with partial villous atrophy, and 2 of 5 with normal biopsies. Changes in water absorption from this solution were depressed in only 5 of 8 with adult celiac disease and 1 each with dermatitis herpetiformis and subtotal villous atrophy and a normal biopsy. It is mentioned that all but 2 patients with dermatitis herpetiformis had been on dapsone which was discontinued at least 5 days prior to the testing. To date, no evidence exists that dapsone is toxic to the jejunal mucosa, since patients may have abnormal biopsies before receiving this drug. The results obtained in this study indicate that using the perfusion technique, more abnormalities of jejunal function in dermatitis herpetiformis patients were demonstrated than would have been expected from routine gastrointestinal function tests. Also, a further link between adult celiac disease and dermatitis herpetiformis was established in that diminished absorption was seen in both conditions.

1258 GLUTEN-SENSITIVE ENTEROPATHY: SYNTHESIS OF ANTIGLIADIN ANTIBODY IN VITRO.

(E.) Falchuk, Z. M.; Strober, W. (Peter Bent Brigham Hosp., Boston, Mass.). *Gut* 15(12):947-952, 1974.

Seven patients (2 men and 5 women, aged 9-55 yr) with gluten-sensitive enteropathy in remission were studied both immediately before and after an oral gluten challenge lasting 6 to 12 days. Jejunal immunoglobulin (IgA and IgM) synthesis was measured in biopsy specimens obtained from the patients. The intestinal mucosa showed a striking increase in IgA and IgM synthesis. Using an affinity chromatography technique it was demonstrated that in 6 of 7 patients about half the net increase in IgA and IgM synthesis occurring after gluten challenge was attributable to the synthesis of antigliadin antibody. This study has shown that, regardless of whether serum or secretion antibody is present or absent, patients with gluten-sensitive enteropathy and not normal persons can and do produce a local antibody response to gluten. The response occurs within the intestinal mucosa where the pathological process is taking place, and it occurs early during the gluten challenge. It is suggested that the mucosal immune response may be conditioned by the presence of an immune response gene or of a cell surface receptor which facilitates a local immune response. The results from this study strengthen the hypothesis that immunological phenomena are related to the pathogenesis of gluten-sensitive enteropathy.

1259 UTILIZATION OF UREA NITROGEN FOR ALBUMIN SYNTHESIS IN THE STAGNANT LOOP SYNDROME.

(E.) Varcoe, R.; Halliday, D.; Tavill, A. S. (MRC Clin. Res. Cent., Harrow, England). *Gut* 15(11):898-902, 1974.

The extent to which the bacterial flora make urea nitrogen available for hepatic protein synthesis was investigated in a 57 yr old male with stagnant loop syndrome. The main clinical features on presentation included severe cachexia, anasarca, the pigmented skin rash of protein malnutrition, tender hepatomegaly, and iron deficiency. Fecal fat excretion was 45 g/24 hr. Small intestinal biopsy was normal. Liver biopsy showed marked fatty infiltration. Barium meal showed partial filling and stasis of a large dilated afferent gastrectomy loop. Fluid obtained by endoscopic intubation of this loop grew *E. coli* and bacteroides. Serum and jejunal fluid contained high concentrations of unconjugated bile acids. Parenteral replacement therapy was instituted before conducting metabolic studies. Despite a smaller than normal urea pool, both the urea synthetic rate and the amount of urea metabolized in the gut were higher than in a normal control. This high non-urinary loss of urea was confirmed by recovery of only 60% of the injected labeled urea dose in the urine, whereas the control excreted 92% of the dose. The low intravascular and total exchangeable albumin pools were associated with abnormally high fractional and absolute catabolic rates of albumin in this patient. This implies an equally high synthetic rate in the steady state. ^{15}N enrichment was much higher than in the control. The decay curve for [^{15}N]albumin gave a half life of 10.3 days, considerably longer than the 7 days half life for ^{125}I-labeled albumin. Urea nitrogen was released into the gut at a rate of 4.3 g/day and this nitrogen is potentially available for protein synthesis. The relatively high enrichment by [^{15}N]albumin in this patient indicates that the liver indeed did make use of this nitrogen for albumin synthesis. Thus it is concluded that urea reutilization is increased in the stagnant loop syndrome as a result of enhanced degradation of urea by bacterial urease. It is noted that, although an increase in urea nitrogen reutilization occurs following increased bacterial urea hydrolysis, its nutritional value to the depleted nitrogen economy of the host is minimal.

1260 THE STAGNANT LOOP SYNDROME IN CHILDHOOD: REVIEW AND REPORT OF FOUR PATIENTS. *(E.)*

Schreiner, R. L.; Ternberg, J. L.; Shackelford, G. D.; Keating, J. P. (Washington Univ. Sch. Med., St. Louis, Mo.). *Am. J. Dig. Dis.* 20(1):23-30, 1975.

Chronic intestinal stasis in 4 female patients (aged 5 1/2-12 yr) was studied. Three of these patients presented as adolescents with no history of bowel surgery. Each of these 3 experienced abdominal or epigastric pain and weight loss. In one, the upper gastrointestinal series disclosed a midjejunal intussusception with a lobulated mass. At laparotomy the intussusception was dilated and reduced. A section of jejunum including a hamartomatous polyp was resected. Striking dilatation and thickening of the jejunum proximal to the intussusception suggested partial obstruction of long duration. In the second adolescent, barium swallow indicated a massively dilated small bowel. Congenital ileal stenosis with markedly dilated proximal ileum was confirmed. The child's megaloblastic anemia was not studied prior to surgery because the preoperative diagnosis was lymphoma. In the third adolescent, barium study showed colonic malrotation and partial obstruction of the distal ileum at an area of marked narrowing. Exploratory laparotomy showed a volvulus involving the midileum, including a large Meckel's diverticulum. The megaloblastic anemia and low serum vitamin B_{12} in this patient were secondary to a dilated segment of ileum proximal to the chronic volvulus. Utilization of vitamin B_{12} by the bacterial overgrowth resulted in this deficiency. Differentiation of stagnant loop syndrome from neoplastic and hematologic disorders is necessary when the syndrome appears initially in later childhood with nutritional and hematologic findings dominating the clinical picture. The 5 1/2 yr old patient developed a stagnant loop syndrome as a complication of surgical repair of congenital intestinal stenosis during her first months of life. Barium examination showed marked dilatation of the duodenum and proximal jejunum associated with thickening of the mucosal folds. It is suggested that antibiotic therapy may be useful as a temporizing measure, but that the final solution of the mechanical and nutritional problems is surgical. It is suggested that long-term antibiotic therapy is not in the best interests of the pediatric patient with this syndrome.

1261 AN ELECTRON-MICROSCOPIC STUDY OF JEJUNAL MUCOSAL MORPHOLOGY IN CONTROL SUBJECTS AND IN PATIENTS WITH TROPICAL SPRUE IN SOUTHERN INDIA. *(E.)*

Mathan, V. I.; Baker, S. J. (Christ. Med. Coll. Hosp., Vellore, India). *Gastroenterology* 68(1):17-32, 1975.

The ultrastructure of the jejunal mucosa obtained by peroral biopsy from 7 control subjects and 12 patients with tropical sprue (aged 15-60 yr) from southern India was studied. Of the 12 patients, 4 had a history of 1 month or less and were from an epidemic of tropical sprue. The remaining 8 patients had endemic sprue and had been ill for periods of 4 months to 8 years. All patients had steatorrhea, low urinary xylose excretion, and defective vitamin B_{12} absorption. None of the biopsies, control or patient, could be considered normal. Compared with biopsies from control subjects in temperate zones, southern Indian control subjects showed minimal increases in lysosomes in surface epithelial cells, an occasional dark-staining degenerating epithelial cell in the upper two-thirds of villi, and an increase in cellular infiltration of surface epithelium and lamina propria. The jejunal epithelial cells of tropical sprue patients had abnormal microvilli, marked increase in lysosomes, increase in intracellular fat, and degenerative changes in rough endoplasmic reticulum and mitochondria. Two types of degenerating epithelial cells, designated pale and dark based on their staining quality, were seen in the villi. Pale staining degenerating cells were also seen in the crypts. The basement membrane region showed an amorphous deposit with many collagen fibers and fat droplets. The epithelial layer and lamina propria showed increased cellular infiltration. In one biopsy from a patient with sprue, particles of possible viral origin were noted.

1262 MALABSORPTION OF ESSENTIAL AMINO ACIDS IN TROPICAL SPRUE. *(E.)* Klipstein, F. A.; Corcino, J. J. (Trop. Malabsorption Unit, Univ. Rochester, N.Y.). *Gastroenterology* 68(2):239-244, 1975.

The absorption of 7 amino acids from an equimolar mixture containing each of the 8 essential amino acids in a concentration of 20 mM was evaluated using a marker perfusion technique in 9 patients (aged 19-70 yr) with untreated tropical sprue and in 6 healthy Puerto Rican control subjects. The absorption of isoleucine, leucine, valine, and threonine was significantly lowered in the sprue patients. In 2 patients, absorption of all 7 amino acids was within normal range. In 4 patients, values for 2 or 3 amino acids were lower than normal, and in 3 patients, values for 4 to 6 amino acids were reduced. No correlation was apparent between reduced values for amino acid absorption and the severity of intestinal abnormalities. Of the 6 neutral amino acids tested, the absorption of phenylalanine was reduced in 1 patient, methionine in 2, and the absorption of each of the other 4 neutral amino acids was reduced in either 5 or 6 patients. The absorption of the dibasic amino acid, lysine, was normal in all but 1 patient. In the 4 patients reevaluated after therapy with tetracycline (250 mg, p.o., 4 times/day) for 2 weeks, all had reduced absorption of at least 2 amino acids, and 2 patients had malabsorption of 5 or 6 amino acids. In 3 patients some evidence of improvement in intestinal function was noted with a return to normal of at least one test of absorption. Two patients had improved jejunal morphology. Of the 3 patients with evidence of improved intestinal function, the absorption of all amino acids rose to within the normal range, with the exception of methionine in 1 patient. In contrast, the 1 patient who showed no evidence of improved intestinal function, the absorption of 5 of the 6 amino acids with low pretreatment values rose, but in no instance to a normal level. Two patients with residual malabsorption of amino acids were studied again after treatment for 5 months with tetracycline (250 mg, p.o., twice/day), folic acid (1 mg/day, p.o.), and vitamin B_{12} (1000 µg, i.m., monthly). Both were asymptomatic after this prolonged treatment, gained weight, and had improved intestinal function and morphology, and absorption of all amino acids tested were within normal ranges. The results of this study indicate that the absorption of certain essential amino acids is reduced in some patients with untreated tropical sprue.

1263 BILE ACID METABOLISM AND INTESTINAL BACTERIAL FLORA AFTER THREE TYPES OF INTESTINAL SHUNT OPERATION FOR OBESITY. *(E.)* Dano, P.; Lenz, K.; Justesen, T. (Rigshosp., Copenhagen, Denmark). *Scand. J. Gastroenterol.* 9(8):767-774, 1974.

The upper jejunal bacterial flora were studied after 3 different types of intestinal shunt operation for obesity on 40 patients (27 women and 13 men, aged 15-53 yr). The results were correlated with bile acid metabolism. The patients weighed from 115 to 188 kg before operation. The types of surgery were: (I), 36 cm of the proximal jejunum measured from Trietz's ligament was anastomosed end-to-side to the distal 12 cm of the ileum measured from the ileocecal junction; (II), 24 cm jejunum was anastomosed to 24 cm ileum; (III), 12 cm jejunum was anastomosed to 36 cm ileum. Breath tests were conducted for bile acid metabolism on 13 patients prior to surgery and all results were normal. After operation, 26 of 34 patients so tested gave abnormal results. The glycine-taurine ratio was normal in all 31 patients so examined prior to operation. Postoperatively this ratio had increased in 12 of 33 patients. Prior to operation, the bile acid concentration was abnormal in 7 of 31 patients. Shunt operation was followed by an abnormally low bile acid concentration in 23 of 33 patients. The decrease in bile acid concentrations after type I and II surgery were statistically significant. Although free bile acids were not noted prior to operation, they were discovered afterwards in 1 patient who received a type II operation and in 4 who received type III surgery. The number of enterobacteria increased in the upper jejunal juice following surgery. The upper jejunal flora were particularly abnormal in patients subjected to type III surgery. Thus, it was concluded that bile acid metabolism in bypass operated patients may depend on bile acid malabsorption and partly on the abnormal intestinal flora.

1264 CALCIUM ABSORPTION AND BONE MINERAL CONTENTS FOLLOWING INTESTINAL SHUNT OPERATION IN OBESITY. A COMPARISON OF THREE TYPES OF OPERATION. *(E.)* Dano, P.; Christiansen, C. (Rigshosp., Copenhagen, Denmark). *Scand. J. Gastroenterol.* 9(8):775-779, 1974.

Calcium absorption and bone mineral contents were examined in 16 patients (4 men and 12 women, aged 18-49 yr) 1 to 2 years after intestinal shunt operation for obesity. Three types of operation had been used, all of them preserving 48 cm small intestine in function, but with varying jejunum:ileum ratio: Type I, 36 cm/12 cm; type II, 24 cm/24 cm; type III, 12 cm/36 cm. Calcium absorption was severely depressed, particularly in type I patients with 8% absorption against a normal of 21%. Type I and II patients had the most decreased bone mineral contents, on an average 88% of normal values. The calcium malabsorption was related to the length of distal small intestine, where passive calcium diffusion predominates, rather than to the length of functioning duodenum and jejunum, where the active calcium absorption takes place. Possibly the abnormal bile acid metabolism associated with a high jejunum:ileum ratio further increases calcium malabsorption. A longer ileal segment secured a higher calcium absorption and led to less demineralization of the bones. It is recommended that the type III operation be used for patients subjected to intestinal shunt operation for obesity.

1265 ORAL BUTTER FAT TEST MEAL WITH SERUM NEPHELOMETRY IN SUSPECTED FAT MALABSORPTION. *(E.)* Bentley, S. J.; Eastham, R. D.; Lane, R. F. (Frenchay Hosp., Bristol, England). *J. Clin. Pathol.* 28(1):80-81, 1975.

The micronephelometer was used to measure changes in serum lipids following the standard oral butter fat test meal of Kabler, Atwood and Schilling, in which a satisfactory increase in serum lipids suggests that there is no fat malabsorption. After a 10 hr fast, subjects were fed orange juice (50 ml), 2 or 3 rounds of toast with pure butter (0.5 g/kg), and 1 or 2 cups of unsweetened tea or coffee with milk, if desired. The test centered on 62 patients with gastrointestinal disorders, including 36 with diarrhea, ulcerative colitis, diverticular disease, and other disorders without overt malabsorption, 10 cases of celiac disease treated with gluten-free diet and one case not so treated, and 15 patients suffering from malabsorption. The results of the test indicated that the butter meal can be used as a preliminary test before fecal fat estimation. If the butter fat meal is followed by a reduced serum lipid increase in a patient, it would then be justifiable to place that patient on a standard diet with a known fat content, for adequate markers to be given, and a careful 3-day fecal fat estimation be carried out. Patients in whom a satisfactory increase in serum lipids of more than 20 LSI units at 2 hr was found would not require fecal fat estimation, unless otherwise clinically indicated.

1266 ABSENCE OF BRUSH BORDER SUCRASE-ISOMALTASE COMPLEX IN CONGENITAL SUCROSE INTOLERANCE. *(E.)* Schmitz, J.; Commegrain, C.; Maestracci, D.; Rey, J. (INSERM, Hosp. Dis. Child., Paris, France). *Biomedicine* 21(11):440-443, 1974.

An attempt was made to compare the brush border membrane protein pattern of a patient lacking sucrase-isomaltase activities to a normal brush border membrane protein pattern in order to gain some insight on the genetic and molecular origin of congenital sucrose intolerance. Normal brush border membrane was studied on macroscopically normal jejunal samples obtained from surgery in 3 children aged 5 months to 3 1/2 yr. Sucrase-isomaltase deficient brush border membrane was obtained from a 10 yr old patient. Polyacrylamide gel electrophoresis indicated that sucrase-isomaltase complex was lacking in the membrane from the patient. This absence may be interpreted as evidence for no protein being synthesized. Or it may also be secondary to the synthesis of an abnormal protein that could not be integrated in the brush border membrane. Contradictory results of other studies point to the possibility of different types of mutation at the origin of sucrose intolerance, as of other inborn errors of metabolism.

1267 THE GLUCOSE-GALACTOSE MALABSORPTION SYNDROME IN A 23-YEAR-OLD WOMAN. *(E.)* Hughes, W. S.; Senior, J. R. (Univ. Pennsylvania Med. Sch., Philadelphia). *Gastroenterology* 68(1): 142-145, 1975.

Intestinal perfusion studies were conducted on a 23 yr old female with the glucose-galactose malabsorption syndrome. The disease was found in the course of a clinical evaluation of malabsorption. The patient had a lifelong history of diarrhea. After ingestion of 100 g of glucose p.o. her blood sugar rose only 12 mg/dl and after 50 g galactose, her blood sugar rose 15 mg/dl, but after 50 g of fructose and 25 g D-xylose, her blood sugar rose 32 mg/dl and 43 mg/dl, resp. During the glucose tolerance test she experienced weakness, nausea, cramping abdominal pain, and profuse watery diarrhea. In her history it was noted that the diarrhea during her infancy was relieved by a formula protein milk which greatly reduced the glucose and galactose content of her diet. In intestinal perfusion studies, about 30% of fructose and 8% of the glucose and galactose solutions were absorbed. These results compare with the absorption of 38% for fructose, and 58 to 64% for glucose and galactose which is recorded in normal subjects. In this patient, the absorption of glucose and galactose was linearly proportional to glucose and galactose concentrations. In the sucrose perfusion studies, a mean of about 30% of the administered sucrose solutions was hydrolyzed under the test conditions. Fructose absorption was evident, but glucose absorption was not demonstrated during sucrose perfusion. It is believed that this is only the third adult patient discovered to have the glucose-galactose malabsorption syndrome.

1268 THE RELATIVE IMPORTANCE OF THE FACTORS INVOLVED IN THE ABSORPTION OF VITAMIN E IN CHILDREN. *(E.)* Muller, D. P. R.; Harries, J. T.; Lloyd, J. K. (Inst. Child Health, London, England). *Gut* 15(12):966-971, 1974.

The vitamin E status and ease of repletion were studied in 25 children (aged 0.1-14 yr) of whom 13 had celiac disease, 4 had intestinal lymphangiectasia, and 8 had abetalipoproteinemia. In celiac disease the mean serum vitamin E concentration was 0.39, and the mean percentage peroxide hemolysis in 9 of them was 13. The mean serum concentration for intestinal lymphangiectasia was 0.28 mg/100 ml. After giving the vitamin in doses of 0.5, 10, and 15 mg/kg/day, the serum levels increased, but normal levels were achieved only with the larger doses. In abetalipoproteinemia, serum vitamin E was undetectable before treatment. An oral load of the water-miscible preparation (120 mg/kg) had no effect. Acute i.m. loads (45 mg/kg over 48 hr and 12.5 mg/kg in a single dose) caused peroxide hemolysis to return to normal within 24 hr in both children so treated. Serum vitamin E was increased to 0.35 mg/100 ml after 5 or 6 hr, but no further rise was noted in the child with abetalipoproteinemia; whereas the levels in the other child, a victim of obstructive jaundice, continued to rise to well within the normal range. Long-term supplements of vitamin E were given p.o., about 100 mg/kg/day, to the children with abetalipoproteinemia. In all 8 children the vitamin could be detected in the serum within 1 year of starting treatment and in 5 the maximum levels were similar to those obtained after i.m. injection. The percentage hemolysis fell during vitamin E therapy in all children in whom it was estimated, and in 7 of the 8 children the minimum levels achieved during vitamin E supplementation were within the normal range. Each of the conditions studied here can represent an experimental model in which one of the intestinal transport steps involved in the absorption of vitamin E is defective. Deficiency was greatest in abetalipoproteinemia and obstructive jaundice, suggesting that normal chylomicron formation and adequate intramural bile salt concentrations are particularly important. Pancreatic enzymes, proximal mucosal integrity, and intestinal lymphatic flow appear less important. Understanding vitamin E absorption is important in treating deficiency states of the vitamin, but it is not clear that correction of low serum levels of this vitamin is of clinical benefit to children with malabsorption.

1269 IMPAIRED CALCIUM ABSORPTION IN UREMIC MAN: EVIDENCE FOR DEFECTIVE ABSORPTION IN THE PROXIMAL SMALL INTESTINE. *(E.)* Brickman, A. S.; Coburn, J. W.; Rowe, P. H.; Massry, S. G.; Norman, A. W. (VA Hosp., Los Angeles, Calif.). *J. Lab. Clin. Med.* 84(6):791-801, 1974.

Studies of intestinal absorption of calcium were carried out in 31 normal subjects, 30 patients with advanced chronic renal failure and 14 uremic patients undergoing regular treatment with hemodialysis. Absorption of radiocalcium was determined at 1, 2, 4, 6, and 25 hr after p.o. administration of the isotope with a 200 mg calcium carrier, using a modification of an external arm-counting method. This method measures what is termed, "apparent absorption", during the first 4 hr after ^{47}Ca ingestion and true absorption thereafter. In normal subjects, apparent absorption was most rapid 0 to 2 hr after ingestion of the isotope, while there was markedly impaired absorption in the patients with uremia during this same time. Between 2 and 6 hr, absorption did not differ between the patients with renal failure and the normal subjects; however, some absorption continued in the uremic patients between 6 and 25 hr, while little or no increase occurred in the normal subjects. There was no difference between ^{47}Ca absorption in patients with chronic stable renal disease and those regularly treated with hemodialysis. Administration of 1,25-dihydroxycholecalciferol (0.68 to 2.7 μg/day) for 6 to 15 days to 8 patients with renal disease caused a marke increase in calcium absorption, particularly during the 0 to 2 hr interval. These data indicate the existence of impaired intestinal absorption of calcium, with reversal of this abnormality following treatment with 1,25-dihydroxycholecalciferol. These observations are consistent with a defect in calcium transport in the proximal part of the small intestine where vitamin D may be most active in stimulating calcium transport. A defect in renal production of 1,25-dihydroxycholecalciferol may be responsible for this abnormality.

1270 JEJUNAL ABSORPTION OF BILE SALTS AFTER RESECTION OF THE ILEUM. *(E.)* Tilson, M. D.; Boyer, J. L.; Wright, H. K. (Yale Univ. Sch. Med., New Haven, Conn.). *Surgery* 77(2):231-234, 1975.

An experiment was designed to test the hypothesis that the jejunum develops increased absorptive capacity for bile salts after loss of the ileum. Everted sacs of jejunal remnants were prepared 3 months after ileectomy in Sprague-Dawley rats. There were 2 control groups of rats, 1 in which the rats underwent sham operation, and another composed of normal, unoperated rats. The mean serosal to mucosal concentration ratio of polyethylene glycol for all sacs was 1.15, indicating a small but significant net secretion of water from the everted sacs. The ratio of taurocholate for normal jejunum and sham jejunum were 1.55 and 1.52, resp., suggesting a small net absorption for those tissues. The ratios for normal ileum and experimental jejunum were 3.08 and 2.61, resp., each of which is significantly increased over the means of normal and sham operated jejunum. The results of this experiment suggest that after an interval of time the jejunum adapts to assume a role in the task of bile salt recovery. Whether the increase in the transport of bile salts is due to either an increase in the affinity of the carrier for the substrate or to an increase in the number of carrier sites cannot be determined by this study. It appears that the alterations of cellular function noted here extend the scope of adaptation considerably beyond simple morphological compensatory hypertrophy.

1271 HYPERPHAGIA IN INTESTINAL DISEASE. *(E.)* Hall, R. J. C.; Creamer, B. (St. Thomas' Hosp., London, England). *Gut* 15(11):858-861, 1974.

he cases of 6 patients (2 women and 4 men, aged 25-
3 yr) with severe malabsorption and steatorrhea in
hom food intake was greatly increased, are described.
aloric intake ranged from 5000 to 11000 kcal/24 hr;
at intake from 168 to 556 g/24 hr. Fecal fat excre-
ion was elevated in 4 patients and steatorrhea was
linically present in the other 2. Despite this fe-
al loss, the calculated fat absorption was consider-
ble in all patients for whom such data were avail-
ble. In one patient with fecal fat excretion of
0 g/24 hr, calculated absorption of dietary fat was
4% (460 g/24 hr). The metabolic fate of this ab-
orbed fat in patients who, despite this, remained
nderweight is unknown. The cause of their malab-
orption was celiac disease in 3 patients, Crohn's
isease with ileal resection in 2, and carcinoma of
he pancreas in 1. There was no evidence of neuro-
ogical or endocrine disease apart from mild diabetes
ellitus in the patient with pancreatic carcinoma.
owever, 3 patients did suffer from severe, prolonged
sychiatric depression which in 2 cases required
lectroconvulsive therapy. In 3 of these patients
he reduction of food intake to more normal levels
roduced an immediate improvement in the steatorrhea.
ne patient maintained a constant body weight with
40% reduction in caloric intake. Another gained
eight on a low-fat diet containing half the calories
e had previously consumed, but a small amount of
luten was also eliminated from the diet and this
ay have been responsible for the weight gain. In
ne patient steatorrhea diminished and weight rose
uring oral corticosteroid therapy and the appetite
ell to normal levels. Treatment in another with
ancreatin (10 g tds) resulted in decreased steator-
hea; fecal fat excretion fell from 88-20 g/day and
ood intake dropped from 5000 to 2000 Kcals/day. It
s suggested that the association of hyperphagia and
evere malabsorption and steatorrhea may be more
ommon than realized.

272 COELIAC DISEASE: ITS IRISH DIMENSIONS.
(E.) McCarthy, C. F. (Reg. Hosp., Galway,
reland). *Ir. J. Med. Sci.* 144(1):1-13, 1975.

273 VITAMIN B_{12} ABSORPTION AND MALABSORPTION.
(Fr.) Rey, J.; Schmitz, J. (Hosp. Sick
hild., Paris, France). *Biol. Gastroenterol. (Paris)*
(3):165-169, 1974.

274 VITAMIN B_{12} ABSORPTION IN PATIENTS WITH
ILEAL RESECTION. *(E.)* Rogers, A. C. N.;
teyn, J. H. (R. Infirm., Aberdeen, Scotland). *Br. J.*
rol. 46(6):625-629, 1974.

275 LACTOSE AND SUCROSE MALABSORPTION IN LATIN
AMERICAN UNIVERSITY STUDENTS. *(Sp.)* Pena
anez, A.; Pena Angulo, J. F.; Paredes, G.; Romero
lasco, B.; Bermudez Garcia, J. M. (Med. Clin. B,
niv. Granada, Spain). *Rev. Esp. Enferm. Apar. Dig.*
4(3):231-248, 1974.

276 CHARACTERIZATION OF HUMAN INTESTINAL LACTASE AND HETERO-β-GALACTOSIDASES OF INFANTS AND ADULTS. *(E.)* Lebenthal, E.; Tsuboi, K. T.; Kretchmer, N. (Div. Dev. Biol. Nutr., Stanford Univ., Calif.). *Gastroenterology* 67(6):1107-1113, 1974.

1277 ROLE OF BILE ACIDS IN FAT MALABSORPTION IN PREMATURE INFANTS. *(Ger.)* Signer, E.; Murphy, G. M.; Anderson, C. M. (no affil.). *Helv. Paediatr. Acta* 33 (suppl):23, 1974.

1278 INTESTINAL TRANSPORT OF AMINO ACIDS, GLUCOSE AND ELECTROLYTES IN A PATIENT WITH PHENYLKETONURIA. *(E.)* Wapnir, R. A.; Lifshitz, F. (North Shore Univ. Hosp., Manhasset, N.Y.). *Clin. Chim. Acta* 54(3):349-356, 1974.

1279 COPPER METABOLISM IN THE STEELY-HAIR SYNDROME. *(E.)* Lott, I. T.; DiPaolo, R.; Schwartz, D.; Janowska, S.; Kanfer, J. N. (Eunice Kennedy Shriver Cent. Ment. Retard., Waltham, Mass.). *N. Engl. J. Med.* 292(4):197-199, 1975.

1280 SELECTIVE HYPOGAMMAGLOBULINEMIA WITH PERSISTENCE OF IgE, MALABSORPTION AND A NUTRITIONALLY DEPENDENT, REVERSIBLE DEFECT IN CELL-MEDIATED IMMUNITY. *(E.)* Levin, D. M.; Lipsky, P. E.; Kirkpatrick, C. H. (Natl. Inst. Allergy Infect. Dis., Bethesda, Md.). *Am. J. Med.* 58(1):129-134, 1975.

1281 SELECTIVE MALABSORPTION OF VITAMIN B_{12}, PROTEINURIA AND HYPOGAMMAGLOBULINAEMIA — A GENETIC DEFECT. *(Ger.)* Goebell, H.; Havemann, K. (Dep. Intern. Med., Univ. Ulm, Germany). *Klin. Wochenschr.* 52(18):874-880, 1974.

1282 CAUSES OF SOME DEFICIENCIES IN GASTROINTESTINAL ABSORPTION OF PENICILLIN. *(Fr.)* Berthoud, S.; Blanc, M. H.; Rossier, J.; Fabre, J. (Med. Polyclin., Univ. Geneva, Switzerland). *Helv. Med. Acta* 27(5/6):370-371, 1974.

1283 DETECTION OF DISORDERS IN BILE SALT METABOLISM IN MALABSORPTION SYNDROMES. *(Fr.)* Voirol, M.; Borel, G. A.; Magnenat, P. (Med. Clin., Univ. Lausanne, Switzerland). *Helv. Med. Acta* 37(5/6):398, 1974.

1284 EFFECTS OF ETHANOL ON SMALL INTESTINAL ABSORPTION. *(E.)* Krasner, N.; Cochran, K. M.; Thompson, C. G.; Carmichael, H. A.; Russell, R. I. (Stobhill Gen. Hosp., Glasgow, Scotland). *Gut* 15(10):831-832, 1974.

1285 ABSORPTION ACTIVITY OF THE SMALL INTESTINE AFTER PARTIAL RESECTION OF LUNG. *(Ukr.)* Faitelberg, R. O.; Nguen-Tai-Luong (Dep. Hum. Anim. Physiol., Univ. Odessa, USSR). *Fiziol. Zh.* 20(6):773-779, 1974.

1286 EVALUATION OF INTESTINAL ABSORPTION BY THE D-XYLOSE TEST IN PATIENTS WITH BRONCHIAL ASTHMA WITH REFERENCE TO SKIN TESTS FOR FOOD ALLERGENS. *(Pol.)* Gruszecka, M. (Acad. Med., Bialystok, Poland). *Pol. Tyg. Lek.* 29(33):1425-1427, 1974.

1287 LACTOFERRIN AND IRON ABSORPTION IN THE SMALL INTESTINE. *(E.)* de Vet, B. J. C. M.; van Gool, J. (Dep. Exp. Intern. Med., Univ. Amsterdam, Netherlands). *Acta Med. Scand.* 196(5):393-402, 1974.

1288 CHRONIC MESENTERIC ARTERIAL INSUFFICIENCY CAUSED BY VASCULAR NEUROFIBROMATOSIS. *(E.)* Brunner, H.; Stacher, G.; Bankl, H.; Grabner, G. (2nd Med. Clin., Univ. Vienna, Austria). *Am. J. Gastroenterol.* 62(5):442-447, 1974.

1289 MICROBIAL COLONIZATION OF THE GASTROINTESTINAL TRACT AND DIARRHEA. *(Ger.)* Bernhard H.; Knoke, M. (Dep. Clin. Biol., Ernst Moritz Arndt Univ., Greifswald, Germany). *Z. Gesamte Inn. Med.* 29(15):632-635, 1974.

See also, 1114, 1129, 1139, 1221, 1222, 1430, 1431, 1532, 1565.

LARGE INTESTINE

1290 INHIBITION OF LEUCOCYTE MIGRATION IN PATIENTS WITH LARGE INTESTINAL CANCER BY EXTRACTS PREPARED FROM LARGE INTESTINAL TUMOURS AND FROM NORMAL COLONIC MUCOSA. *(E.)* McIllmurray, M. B.; Price, M. R.; Langman, M. J. S. (City Hosp., Nottingham, England). *Br. J. Cancer* 29(4):305-311, 1974.

To determine if the technique of leukocyte migration inhibition is a sensitive measure of cell-mediated immunity, the responses of leukocytes from 25 patients (mean age 63.6 yr) with large bowel cancer to extracts prepared from both large bowel tumors and normal large bowel mucosa were examined and compared with the responses obtained with leukocytes from age and sex matched control individuals (mean age 62.7 yr). In 15 experiments, cancer extract was added to the leukocytes from both cancer patients and non-cancer controls to give final protein concentrations of 1 mg/ml or 2 mg/ml, and the migration index was expressed as the ratio of the mean area of migration of leukocytes incubated with cancer extract to that of the leukocytes from the same source incubated with medium alone. In a further 10 experiments, leukocytes were incubated in both cancer and normal mucosal extract, again at protein concentrations of 1 mg/ml or 2 mg/ml and the specific migration index expressed as the ratio of the mean area of migration following incubation with cancer extract compared with that of leukocytes from the same source incubated with normal extract. Indices of less than 1 indicate inhibition by cancer extract and values greater than 1, stimulation. When leukocytes were incubated with cancer extract at a protein concentration of 1 mg/ml, the mean migration index of the cancer group was only slightly lower than that for the control group (0.76 and 0.83, resp.). In 10 of 15 paired experiments, however, the migration index of the cancer patient was less than that of the control and the differences were statistically significant. At extract protein concentrations of 2 mg/ml, the mean specific migration index in the cancer patients was 0.88 and in the control patients, 1.01. At 1 mg/ml, the mean specific migration index was 0.78 in the cancer patients and 0.87 in the controls. In of 10 paired experiments at 1 mg/ml and in 7 of 10 paired experiments at 2 mg/ml, the specific migration index in the cancer patients was less than that of th corresponding controls and the differences were stati tically significant. There was no correlation betwee the degree of migration inhibition in the cancer patients and the extent of the tumor found at operation It is concluded that immunological reactivity can be demonstrated to tumor extracts by *in vitro* leukocyte preparations. Nonspecific toxicity cannot account for the findings since both cancer and control group samples underwent incubation with the same extracts under the same conditions. Since reactivity tended to be greater in response to cancer extracts than to normal mucosal extracts, it is further suggested that the responses are primarily directed at some component of the tumor itself.

1291 PROGNOSTIC FACTORS IN COLON CARCINOMA. CORRELATION OF SERUM CARCINOMEMBRYONIC ANTIGEN LEVEL AND TUMOR HISTOPATHOLOGY. *(E.)* Zamcheck, N.; Doos, W. G.; Prudente, R.; Lurie, B. B.; Gottlieb, L. S. (Harvard Med. Sch., Boston, Mass.). *Hum. Pathol.* 6(1):31-45, 1975.

1292 FAMILIAL POLYPOSIS AS A DEFINITE FORM OF PRECANCER. *(Ger.)* Schier, J. (Surg. Clin. Univ. Mainz, Germany). *Langenbecks Arch. Chir.* 337:772-774, 1974.

1293 PROPHYLACTIC TREATMENT WITH BACITRACIN-NEOMYCIN AND TETRACYCLINE IN SURGERY OF COLON AND RECTUM. *(E.)* Jorgensen, S. J.; Weile, F. (Kobenhavns Amts Hosp., Glostrup, Denmark). *Acta Chir. Scand.* 140(6):491-493, 1974.

1294 THE HEALING OF CHRONIC COLONIC ULCERS IN THE RAT. *(E.)* Reeve, D. R. E. (R. Coll. Surg. England, London). *Br. J. Exp. Pathol.* 55(6):533-540, 1974.

1295 EVANESCENT COLITIS IN A CHILD. *(E.)* Friedland, G. W.; Filly, R. (Stanford Univ. Med. ent., Calif.). *Pediatr. Radiol.* 2(1):73-74, 1974.

See also, 0817, 1137, 1170, 1171, 1177, 1526, 1541, 1547, 1584, 1595.

LARGE INTESTINE

Ulcerative Colitis

296 ULCERATIVE COLITIS IN THE JEWISH POPULATION OF TEL-AVIV YAFO. II. THE RARITY OF MALIG-IANT DEGENERATION. *(E.)* Gilat, T.; Zemishlany, Z.; ibak, J.; Benaroya, Y.; Lilos, P. (Ichilov Hosp., el-Aviv, Israel). *Gastroenterology* 67(5):933-938, 974.

hree cases of carcinoma of the colon were found among 04 Jewish patients (260 men and 244 women, aged 1 to ver 70 yr) with ulcerative colitis who resided in the el-Aviv area. The majority of cases had substantial r universal involvement of the colon and the length f follow-up was 1-46 yr. The mean follow-up was .54 yr with more than 100 cases studied for more than 2 yr. The expected incidence of carcinoma of the olon for a matched group of general population would e 0.9 cases. The 3 cases found in this series amount-d to an incidence of 0.6%. All 3 of these patients ad been born in Europe and had resided in Israel for 1 to 44 yr. The increased incidence of carcinoma of he colon in patients with ulcerative colitis has been onfirmed by numerous studies in various parts of the orld. However, in most of these studies the inci-ence ranged from 2.5 to 7.6% or even higher. The .6% incidence found in this study is obviously much ower. These differences suggest that the incidence f carcinoma of the colon in ulcerative colitis pa-ients may vary in different populations.

297 METABOLIC ALKALOSIS IN "TOXIC MEGACOLON". *(E.)* Caprilli, R.; Alessandrini, A.; otta, F. (2nd Med. Clin., Univ. Rome, Italy). *end. Gastroenterol.* 6(1):23-28, 1974.

he acid-base balance in 8 patients with acute, severe lcerative colitis complicated by toxic megacolon was tudied. A disorder of the acid-base balance charac-erized by metabolic alkalosis was present in all 16 bservations. The pCO_2 value was often below normal, indicating not only the absence of the compensatory respiratory mechanism, but the presence of hyperventilation as well. Hypokalemia was present in 8 observations (50%), hyponatremia in 4 (25%) and hypochloremia in 14 (87%). The mean value of Cl^- was very low (91 mEq/liter) while those of K^+ and Na^+ were within the normal range. Although hyponatremia was present in only 25% of the observations, serum Na^+ data showed a correlation with serum bicarbonate inasmuch as a very low Na^+ value corresponded to a moderate increase of bicarbonate, while the Na^+ became normal when the bicarbonate reached very high levels. This suggests that Na^+ depletion occurs very early in toxic megacolon and that the increased plasma bicarbonate levels are probably due to the secondary enhancement of renal tubular resorption of Na^+. In the presence of Cl^- depletion, there is a deficiency of resorbable anions. Therefore, tubular resorption of Na^+ occurs with a persisting removal of bicarbonate from the renal tubular fluid and in exchange for H^+ and K^+ with resulting aciduria, kaliuria, and metabolic alkalosis. Toxic megacolon must be corrected by the administration of chloride, potassium, sodium, and fluids. Minimum daily doses administered parenterally in this study were 230 mEq for sodium and chloride, 120 mEq for potassium and 2500 ml of fluids. Of these 8 patients, 7 recovered and subsequently underwent elective surgery. The 1 death occurred in a patient undergoing urgent surgery in whom a very high degree of colonic dilatation and extremely severe metabolic alkalosis were present.

See also, 1150, 1295.

PANCREAS

298 PANCREATIC ABSCESS. *(E.)* Jones, C. E.; Polk, Jr., H. C.; Fulton, R. L. (Univ. ouisville Sch. Med., Ky.). *Am. J. Surg.* 129(1): 4-47, 1975.

review of 13 patients with pancreatic abscess (10 men nd 3 women, aged 24-64 yr) was conducted. Only one atient presented with the classic syndrome of suc-essfully treated acute pancreatitis followed in everal weeks by recrudescence of symptoms and onset f a septic course. Biliary tract disease was pre-ent in 5 patients, chronic alcoholism in 3, blunt pancreatic trauma in 2 and penetrating pancreatic trauma in 3. In general, the signs and symptoms were vague and nonspecific. Of the 8 who presented with evidence of peritonitis and occult progressive sepsis, 4 had recent histories of pancreatitis. Pancreatic abscesses after pancreatic trauma were encountered in 5 patients. Roentgenograms were helpful in preoperative diagnosis in 6 patients, and retrospectively in 2 more. Routine abdominal x-ray examinations made in 11 patients gave abnormal results in 3. Contrast studies were extremely helpful in 6 of the 8 patients so evaluated. Upper gastrointestinal series in 4 patients demonstrated flattening and anterior displacement of the stomach, retrogastric extraluminal air, or widening and effacement of the duodenal loop. Intravenous pyelography, showing blurred contour and lateral displacement of the left kidney with extrinsic compression on the collecting system, was diagnostically useful in 1 patient. Sinus tract injection documented pancreatic abscess in another. Barium enema and an i.v. pyelogram gave normal results in 2 patients subsequently found to have pancreatic abscess. Nine patients were treated and 8 survived. External drainage was employed in 8 and internal gastric drainage in 1 patient. The interval between hospitalization and successful diagnosis and drainage averaged 6 days in survivors. Diagnosis and external drainage were delayed 21 days in the 1 treated patient who died. Four patients were not treated and none survived. Preoperative assessment was correct in 4 patients. The majority of the abscesses were polymicrobic infections with gram-negative enteric pathogens predominating. Complications were frequent and multiple. It is concluded that successful management of pancreatic abscess requires early diagnosis and prompt external surgical drainage.

1299 THE NATURAL AND UNNATURAL HISTORY OF PANCREATIC PSEUDOCYSTS. *(E.)* Sankaran, S.; Walt, A. J. (Wayne State Univ. Sch. Med., Detroit, Mich.). *Br. J. Surg.* 62(1):37-44, 1975.

Experience with 131 pseudocysts of the pancreas in 112 patients (86 men and 26 women, aged 16-79 yr, mean age of 41 yr) is reported. The development of a pseudocyst was preceded by pancreatitis in 90% or by pancreatic trauma in 10%. Alcoholism was the principal cause of the pancreatitis. Of the 19 patients with cholelithiasis, not one stone was detected in the common bile duct. One patient was a renal transplant recipient on steroids and azathiaprine. Twenty-three percent of the patients were anemic and most appeared malnourished. Radiographic studies demonstrated a mass in the region of the pancreas in only 75% of the cases. Thirty-four (26%) pseudocysts were located in the head of the pancreas. Of these, 12 (30%) caused significant obstruction of the common bile duct or duodenum. Spontaneous regression occurred in 8%. Complications arose in 33.5% of the pseudocysts, including obstruction of adjacent organs, rupture, hemorrhage and pancreatic ascites. In 14 pseudocysts, rupture into the gastrointestinal tract, the peritoneal cavity or the pleural cavity, when unassociated with hemorrhage, had a mortality rate of 14%. In 16 patients with significant hemorrhage associated with a pseudocyst, the mortality rate was 61%; early direct surgical control is advocated. Pancreatic ascites was associated with 14.5% of the pseudocysts and had a 40% recurrence rate, which can be greatly diminished when operative procedures are guided by pancreatography. The mortality rate for the surgical treatment of 97 uncomplicated pseudocysts was 6% and the recurrence rate was 11%. The prime cause of death was hemorrhage. Of the 131 pseudocysts, 7 were synchronous and 12 were metachronous. It is suggested that small cysts of the head of the pancreas, impalpable at operation but demonstrable by pancreatography, may be the cause of severe, continuing or recurrent symptoms.

1300 SPONTANEOUS RESOLUTION OF PANCREATIC PSEUDOCYSTS: IMPLICATIONS FOR TIMING OF OPERATIVE INTERVENTION. *(E.)* Bradley, III, E. L.; Clements, L. J. (Emory Univ. Sch. Med., Atlanta, Ga.). *Am. J. Surg.* 129(1):23-28, 1975.

Diagnostic ultrasound was used in the management of 38 patients with pancreatitis who presented with either a palpable abdominal mass or marked anterior gastric or duodenal displacement by upper gastrointestinal series. During this investigation, cystic masses in 5 patients (4 men and 1 woman, aged 14-43 yr) spontaneously resolved as serially documented by clinical, radiologic, and ultrasonic means. Of these 5 patients, 3 were chronic alcoholics and the other 2 suffered with diabetes. In each case the abdominal mass spontaneously disappeared within 7 days. The pseudocyst recurred in 1 patient after 4 months time. There has been no recurrence in the remaining 4 patients over a period as long as 12 months. Two of these patients have had recurrent pancreatitis with no recurrence of the pseudocyst. This report clearly demonstrates that spontaneous resolution of retrogastric cystic structures in patients with presumed pancreatic pseudocysts does occur. Since no histologic information is obtainable by the technique of ultrasound, absolute identification of the origin of the retroperitoneal cysts is not possible. However, the absence of any abnormalities on i.v. pyelography, and knowing the anatomical location in a group of patients with historical and clinical evidence of active pancreatic disease, the assumption that these cystic structures were indeed pesudocysts is not unwarranted. It is suggested that the technique of ultrasound be more widely used for definitive diagnoses which may avoid unnecessary explorative surgery.

1301 DIMINISHED EXCRETION OF BICARBONATE FROM THE SINGLE SWEAT GLAND OF PATIENTS WITH CYSTIC FIBROSIS OF THE PANCREAS. *(E.)* Kaiser, D.; Drack, E. (Dep. Pediatr., Univ. Bern, Switzerland). *Eur. J. Clin. Invest.* 4(4):261-265, 1974.

Using pH-microelectrodes the excretion of H^+ and HCO_3^- in relation to flow rate was investigated in a single sweat gland in 8 cystic fibrosis children (5 males and 3 females). In the sweat of patients with cystic fibrosis, the pH values were extremely high, significantly exceeding control values. Also in the cystic fibrosis children, the majority of the values for HCO_3^- concentration exceeded those of the control group, with the highest values amounting to 75 mEq/liter. These results indicate that, in the single sweat gland of cystic fibrosis patients in addition to increased concentrations of Na^+ and K^+ the excretion of H^+ and HCO_3- differs from normal. A more alkaline and HCO_3--rich sweat was produced at all sweat rates. It is suggested that, due to reduced secretion of H^+ in the duct, both the reabsorption of Na^+ and the secretion of K^+ may be impaired. The reduced flux of H^+ may similarly be responsible for the excretory defect in the duct system of the

ncreas. Reduced flux of protons across the luminal
embrane of epithelial cells is proposed as a general
eature of exocrine gland defects. It is then
ssible to describe both the cationic transport
efect of the sweat gland duct and the anionic
carbonate-secretory defect in one term.

02 CARCINOMA OF THE PANCREAS IN A 14-YEAR-OLD
BOY. *(It.)* Vincenti, R.; Chiavarelli, R.
ep. Surg. Symptomatol., Univ. Rome, Italy). *Poli-*
inico [*Chir.*] 81(2):69-77, 1974.

03 CRITERIA FOR LIMITING RADICAL OPERATIONS
FOR CANCER OF THE PANCREATODUODENAL REGION.
us.) Linchenko, I. F.; Gumilevskaia, E. M. (Stav-
pol Med. Inst., USSR). *Khirurgiia (Mosk.)* (1):72-
, 1974.

04 ACUTE MESENTERIC-PORTAL OBSTRUCTION DURING
CEPHALIC DUODENOPANCREATECTOMY. THERAPEUTIC
SSIBILITIES IN TWO CASES. *(Fr.)* Clot, J. P.;
court, F.; Cady, J.; Mercadier, M. (La Pitie Hosp.,
ris, France). *J. Chir. (Paris)* 107(1):53-60, 1974.

05 MORPHOLOGICAL AND HISTOCHEMICAL CHANGES IN
THE STUMP OF THE PANCREATIC GLAND AFTER
NCREATODUODENAL RESECTION. *(Rus.)* Aganezov, S. A.;
rzadaev, R. O. (I.P. Pavlov 1st Med. Inst., Lenin-
ad, USSR). *Arkh. Anat. Gistol. Embriol.* 67(10):15-
, 1974.

06 GASTROINTESTINAL AND ENDOCRINE FUNCTION
AFTER PARTIAL DUODENOPANCREATECTOMY. *(Ger.)*
elke, F.; Beger, H. G.; Schirop, T. (Med. Clin., Free Univ. Berlin, Germany). *Dtsch. Med. Wochenschr.* 31(5):171-176, 1974.

1307 BLOOD VESSELS OF THE PANCREATODUODENAL REGION AFTER EXPERIMENTAL RESECTION OF THE PANCREAS. *(Rus.)* Poliak, R. I.; Khunov, Z. D. (Stavropol Med. Inst., USSR). *Arkh. Anat. Gistol. Embriol.* 67(10): 91-96, 1974.

1308 TOTAL PANCREATECTOMY IN JAPAN. *(Jpn.)* Nakase, A. (Kyoto Univ. Med. Sch., Japan). *Arch. Jpn. Chir.* 42(2):151-156, 1973.

1309 EXOCRINE PANCREATIC FUNCTION IN RENAL INSUFFICIENCY. *(Ger.)* Gerhardt, W.; Stein, G.; Bosseckert, H.; Graupner, C.; Noske, A. (Med. Clin., Friedrich Schiller Univ., Jena, Germany). *Z. Ges. Inn. Med.* 29(21):895-898, 1974.

1310 CONSERVATIVE TREATMENT OF MECONIUM ILEUS WITH VISOTRAST ENEMAS. *(Ger.)* Hormann, D.; Gottschalk, M. (Clin. Pediatr. Surg., Karl Marx Univ., Leipzig, Germany). *Kinderaerztl. Prax.* 42(3):106-112, 1974.

See also, 1128, 1140, 1141, 1168, 1172, 1173, 1175, 1176, 1203, 1271, 1316, 1317, 1414, 1502.

PANCREAS

Pancreatitis

11 ACUTE PANCREATITIS AFTER ENDOSCOPIC/RADIO-
LOGICAL PANCREATICOGRAPHY (ERP). *(E.)*
ppin, H.; Amon, R.; Ettl, W.; Classen, M.; Demling,
(Med. Dep., Univ. Erlangen-Nuremberg, Erlangen, Ger-
ny). *Endoscopy* 6(2):94-98, 1974.

retrospective examination of the period following
doscopic-radiological pancreaticography in 569 pa-
ents is reported. In all of the 569 cases, 60%
ntrast medium had been used. Subsequent to the
amination, 42 patients presented symptoms of acute
ncreatitis, including fever, elevated amylase in
e serum or urine, leukocytosis and usually epi-
stric pain. An additional 6 patients presented
th pseudocyst infections. An additional 188 pa-
ents showed slight signs of infection but no un-
uivocal indications of pancreatitis. Acute pan-
eatitis occurred much more frequently in patients
whom contrast medium had pervaded the parenchyma of
e pancreas. On the other hand, an increase in the
currence of pancreatitis in pathological findings
the pancreatic duct system was not noted. In 40 cases conservative therapy with antibiotics, and in severe cases additional treatment with trasylol, atropine, fasting and shock prophylaxis, produced rapid disappearance of the symptoms and a normalization of the objective findings. However, 2 fatalities occurred consequent upon acute tryptic and suppurating pancreatitis, resp. A 3rd patient died during the course of a secondary infection of a pseudocyst of the pancreas subsequent to pancreaticography. This study showed that the development of acute pancreatitis is a much more frequent complication of endoscopic-retrograde pancreatography, 7.4%, than had previously been thought. It is stressed that the filling of the acini and the pancreatic tissue with contrast material must be avoided.

1312 THE INFLUENCE OF GLUCAGON ON ACUTE EXPERIMENTAL PANCREATITIS IN THE RAT. *(E.)* Lankisch, P. G.; Winckler, K.; Bokermann, M.; Schmidt, H.; Creutzfeldt, W. (Dep. Med., Univ. Gottingen, Germany). *Scand. J. Gastroenterol.* 9(8):725-729, 1974.

The effects of glucagon on the course of experimental acute pancreatitis induced by corn oil or by Na-taurocholate in the male Wistar rat were studied. Glucagon suspended in corn oil given s.c. at single doses of 0.24 mg every 6 hr for 18 hr, decreased pancreatic enzymes to levels between 10.9 and 38.8% of controls, and affected lipase least and phospholipase A most. Glucagon did not influence the mortality rate in severe (oil-induced) pancreatitis when given before or after operation. When rats were sacrificed at 6 hr after induction of oil-induced pancreatitis, the amount of ascites seen was significantly lower in the pretreated group. Ascites was not lowered in rats treated after induction of pancreatitis. Glucagon did somewhat lower the mortality rate in medium severe (Na-taurocholate-induced) pancreatitis both when given before and after pancreatitis induction. Except for a reduction of zymogen granules, glucagon had no significant effect on any of the morphological parameters (ascites, fat necrosis, pancreas necrosis, edema, and leukocyte infiltration). The effect of glucagon pretreatment on the increase of amlyase and lipase was investigated 6 hr after induction of oil-induced pancreatitis. This increase of both enzymes was significantly less after glucagon pretreatment. Glucagon treatment immediately postoperatively also had an effect on serum enzymes. Lipase was significantly lower in the glucagon-treated group when compared with non-treated rats 6 hr after induction of pancreatitis. In the same animals, serum amylase levels were also lowered under treatment, but not significantly so. It is thus concluded that glucagon pretreatment and treatment significantly reduced serum enzymes but did not significantly influence the mortality rate and morphological parameters of a severe or medium severe form of experimental pancreatitis.

1313 SOME CLINICAL SIGNS OF CHRONIC PANCREATITIS.

(Rus.) Volosevich, N. V. (Goriachii Kliuch Sanit., USSR). *Vrach. Delo* (12):85-87, 1974.

1314 102 CASES OF CHRONIC PANCREATITIS: STUDY OF CLINICAL FEATURES AND COURSE.

(Fr.) Bernades, P.; Callet, B.; Dupuy, R. (Beaujon Hosp., Clichy, France). *Nouv. Presse Med.* 4(3):149-152, 1975

1315 PARAPANCREATITIS AS AN IMPORTANT COMPONENT OF SEVERE FORMS OF ACUTE PANCREATITIS.

(Rus.) Filin, V. I.; Spasskaia, M. G.; Zharenkova, V. D. (I. I. Dzhanelidze Inst. Emerg. Med. Treat., Leningrad, USSR). *Vestn. Khir.* 113(9):7-13, 1974.

1316 STATISTICAL ANALYSIS OF PAIN IN PANCREATIC DISEASE.

(Fr.) Cornee, J.; Durbec, J. P.; Yoro, M.; Lauret, F. (Res. Unit Gastrointest. Dis., INSERM, Marseilles, France). *Arch. Fr. Mal. App. Dig.* 63(5):375-384, 1974.

1317 RARE INDICATIONS FOR DUODENOPANCREATECTOMY.

(Ger.) Hoffmann, E.; Gebhardt, C.; Derra, Jr., E. (Surg. Clin., Univ. Dusseldorf, Germany). *Bruns Beitr. Klin. Chir.* 221(5):379-385, 1974.

See also, 1142, 1174, 1178, 1304, 1481.

LIVER AND BILIARY TRACT

1318 CLINICAL USE OF CORTICOSTEROID AND IMMUNOSUPPRESSIVE DRUGS IN LIVER DISEASE.

(E.) Fung, W. P. (Fac. Med., Univ. Singapore). *Drugs* 8(2):139-145, 1974.

The current status of the clinical use of steroids and immunosuppressants in liver disease is reviewed. Although steroids and immunosuppressants are not routinely indicated in cases of uncomplicated viral hepatitis, steroids may be used in the uncommon case complicated by: 1) prolonged cholestasis past 4 weeks in which extrahepatic causes have been excluded (prednisolone 10 mg 3 times daily until recovery); 2) chronic hepatitis persisting more than 3 months; 3) fulminant hepatitis with hepatic coma (200-500 mg hydrocortisone i.v. every 6 hr as a last resort) although results have not been encouraging. Immunosuppressants such as azathioprine and 6-mercaptopurine are not indicated in these conditions and may, indeed, aggravate the situation. Chronic active hepatitis, which carries a relatively poorer prognosis, may respond symptomatically and with reduced early mortality to prednisolone (20 mg 3 times daily until improvement then 5 mg 3 times daily maintenance) and/or azathioprine (25-50 mg daily increasing to 100 mg daily as needed). These drugs do not change overall survival or prevent cirrhosis in these patients. Steroids are of little or no value and immunosuppressants are not indicated in patients with drug-induced cholestasis, cryptogenic cirrhosis or extrahepatic obstructive jaundice. Steroids may be used in active post-necrotic or post-hepatic cirrhosis and in cholangiohepatitis complicated by *E. coli* septicemia.

1319 RADIOIMMUNOASSAY OF α-FETOPROTEIN IN HUMAN SERUM. CLINICAL VALUE IN PATIENTS WITH LIVER DISEASES.

(E.) Chayvialle, J. A. P.; Touillon, C.; Crozier, C.; Lambert, R. (INSERM, Edouard-Herriot Hosp., Lyon, France). *Am. J. Dig Dis.* 19(12):1102-1110, 1974.

A radioimmunoassay has been developed for human α_1-fetoprotein. The method involves competitive inhibition of the binding of purified ^{125}I-α_1-fetoprotein to specific antiserum by human test serum. The sensitivity of the assay is 0.5-1.0 ng/ml of serum. Mean serum α_1-fetoprotein level in 136 healthy adults was 3.8 ng/ml. All 34 patients with histologically proven primary hepatocellular carcinoma had abnormally high levels which were, however, only moderately high (<500 ng/ml) in 5. Four of 19 patients with metastatic liver disease and 39 of 118 patients with nonneoplastic liver diseases had moderately elevated serum α_1-fetoprotein levels ranging from 7.7 to 500 ng/ml indicating that a moderately elevated level is not diagnostic for malignant hepatoma. In 1 patient with familial hemochromatosis, a transient rise (69.2 ng/ml) in serum α_1-fetoprotein was seen which subsequently returned to a stable upper-normal level. Thus, the radioimmunoassay for α_1-fetoprotein may be useful in following patients with nonneoplastic liver disease who have a high risk of developing hepatocellular carcinoma.

1320 α-FETOPROTEIN: EXPRESSION IN HUMAN DISEASE AND IN RAT EXPERIMENTAL MODELS. *(E.)*

Wepsic, H. T.; Sell, S. (San Diego Med. Sch., Univ. Calif.). *Prog. Exp. Tumor Res.* 19:297-324, 1974.

Recent observations on the relationship of α_1-fetoprotein to human malignancy and other disease states and comparison of these to findings in experimental rat tumor models are summarized. Results based on radioimmunoassay indicate that normal humans have basal levels of α_1-fetoprotein (1.5-16.5 ng/ml) which are immunologically indistinguishable from the α_1-fetoprotein associated with hepatoma. Thus, a normal limit of 20 ng/ml is generally accepted. Factors which can influence serum α_1-fetoprotein levels include race (higher in non-Caucasians), age (higher correlation with hepatoma in younger patients), sex (males>females), differentiation and size of tumor (more commonly present with poorly differentiated, large tumors) and site (most common with hepatocellular carcinoma). Studies both in Morris hepatoma-bearing and tumor-excised rats and in hepatoma-bearing humans show a correlation between serum α_1-fetoprotein concentration and the rate of growth and amount of tumor tissue present. A fall in α_1-fetoprotein concentration to normal or negligible levels following surgery is associated with removal of the tumor and may be used to follow the patient clinically. The presence of metastatic tumor in rats which had their primary excised could be predicted by rising serum α_1-fetoprotein levels up to 30 days prior to their detection on physical examination. A fall in serum α_1-fetoprotein levels has also been correlated with a clinical response to chemotherapy in humans. α_1-Fetoprotein has also been observed in patients with testicular and ovarian germinal cell tumors (especially poorly differentiated), in non-gonadal teratomas and in a few cases of tumor metastatic to the liver from lung, pancreas, stomach, gallbladder, lymphoma, urinary bladder and uterus. Transiently elevated serum α_1-fetoprotein concentrations have been associated with acute viral hepatitis; the possible relationship between α_1-fetoprotein, Australia antigen and hepatoma is still under debate. Elevated α_1-fetoprotein levels have also been detected in patients with cirrhosis, especially the postnecrotic type, in patients with regenerating liver following partial hepatectomy and rarely in patients with other disease affecting the liver. Increased α_1-fetoprotein may also be seen in the serum of pregnant females in association with fetal distress, intrauterine death or severe dysfunction.

1321 α_1-ANTITRYPSIN DEFICIENCY AND LIVER DISEASE IN CHILDHOOD: GENETIC, IMMUNOCHEMICAL, HISTOLOGICAL, AND ULTRASTRUCTURAL DIAGNOSIS. *(E.)*

Ward, A. M.; Underwood, J. C. E. (Hallamshire Hosp., Sheffield, England). *J. Clin. Pathol.* 27(6):467-472, 1974.

The clinical characteristics of 8 children with liver disease associated with α_1-antitrypsin deficiency and detailed histologic examination of liver tissue from 3 of these are presented. All the children presented initially with gradual onset of painless obstructive jaundice at 2-3 weeks of age which persisted for a few weeks before spontaneously regressing. There was no associated fever or failure to thrive and the only physical finding was an enlarged, often firm, liver. All exhibited the homozygous deficiency state characterized by serum α_1-antitrypsin levels 0.50 mg/liter and Pi phenotypes ZZ. All parents were heterozygous MZ with intermediate α_1-antitrypsin levels. All children's sera were Australia antigen- and antibody-negative. The dominant liver change seen on light microscopy was lymphoreticular infiltration and expansion of the portal tracts by fibrous proliferation. Numerous PAS-positive, diastase-resistant granules were present within the cytoplasm of hepatocytes at the periphery of the surviving lobules or regeneration nodules, but were not seen in biopsies from children with hepatitis or biliary tract obstruction in the absence of α_1-antitrypsin deficiency. Immunofluorescent microscopy using specific antisera confirmed the presence of excessive amounts of α_1-antitrypsin within hepatocytes of the diseased deficient children. Electron microscopy showed numerous 3 μm diameter globules containing amorphous material and bounded by a single membrane in apparent continuity with the endoplasmic reticulum of the periportal hepatocytes. These findings suggest that α_1-antitrypsin synthesis in the Pi ZZ homozygote is defective and that this induces, as a secondary phenomenon, an abnormality in intracellular transport.

1322 HEPATOCELLULAR CARCINOMA AND PARTIAL DEFICIENCY OF ALPHA-1-ANTITRYPSIN (MZ). *(E.)*

Rawlings, Jr., W.; Moss, J.; Cooper, H. S.; Hamilton, S. R. (Johns Hopkins Univ. Sch. Med., Baltimore, Md.). *Ann. Intern. Med.* 81(6):771-773, 1974.

Two case histories are presented in which hepatocellular carcinoma was associated with the heterozygous (MZ) state for α_1-antitrypsin deficiency. Both patients presented with liver disease of uncertain etiology. The first, a 66-yr-old male with a past history of surgically cured squamous cell carcinoma presented with ascites, hepatomegaly and edema. Serum electrophoresis showed a low α_1-globulin fraction of 0.1 g% (normal = 0.1-0.4 g%). Immunoelectrophoresis revealed an MZ phenotype. α_1-Fetoprotein was negative. The patient subsequently died of massive upper gastrointestinal bleeding and sepsis. At necropsy, the patient was found to have hepatic cirrhosis with a multifocal, nonmetastatic hepatocellular carcinoma. The hepatocytes contained PAS negative, diastase-resistant granules which were not present in tumor cells. The second patient, a 64-

yr-old white male, presented with malaise, weakness, jaundice and hepatomegaly. Serum α_1-globulin was 0.2 g%. α_1-Fetoprotein was negative and the patient had an MZ phenotype. The patient died of upper gastrointestinal bleeding and hepatic failure. Necropsy revealed hepatocellular carcinoma with severe focal bullous emphysema and metastases in the lungs. Periportal hepatocytes, but not tumor cells, contained PAS positive, diastase-resistant granules. The rarity of both the Z allele and hepatocellular carcinoma suggest a real association between the heterozygous state of α_1-antitrypsin deficiency and this malignancy.

1323 LIVER CELL CARCINOMA DURING THE PRIME OF LIFE. *(E.)* Mabogunje, O.; Rosen, P. P.; Fortner, J. G. (Mem. Sloan-Kettering Cancer Cent., New York, N.Y.). *Surg. Gynecol. Obstet.* 140(1):75-80, 1975.

The clinical and pathologic conditions as well as the response to treatment were studied in 43 patients (11-40 yr old) who were diagnosed between 1949 and 1972 as having primary liver cell carcinoma. Nineteen patients were male and 24 were female. Presenting symptoms included weight loss or right upper quadrant pain (65%), fatigue, anorexia and intermittent fever (33%) and abdominal mass (20%). Only 1 patient had jaundice. Hepatomegaly was present in 88%, being tender in about half of these. Most patients had a classic liver profile with normal bilirubin and elevated alkaline phosphatase ranging from 58-1750 IU (normal = 31-82), 5'nucleotidase (12.2-365 Cample U; normal = 3.2-13.6) and sodium sulfobromophthalein retention (2-37%; normal = 0-5%). Serum α_1-fetoprotein was present in 5 of 9 patients tested. Ten patients had angiography and 13 had a liver scan; both studies were done in 8 patients, agreeing and accurately localizing the tumor in 6 cases (75%). Two patients also had erythrocytosis, 1 developed preterminal hypoglycemia and 1 had hypercholesterolemia with hyperproteinemia. Autopsy of 13 patients revealed cirrhosis in 3. Only 3 patients had a previous history of liver disease including hepatitis and idiopathic jaundice. Tumor was confined to 1 lobe in 7 patients and both lobes in 10. Ten patients showed local nodal and 16 showed widespread metastatic disease. Primaries were multicentric in 27. Survival ranged from 3 months in 6 patients who were not treated, 1-30 months (median of 9 months) in 12 patients who received radiation only to the liver (3000-4000 rads), to 1-26 months (median of 5 months) in patients treated with chemotherapy. Of 10 patients treated by lobectomy, 2 are alive after 25 and 21 months, resp., the latter free of disease, and 2 have survived 12.5 and 13.5 yr, resp. (20% 10 yr survival). These survival rates do not differ significantly from those reported for older populations.

1324 PRIMARY HEPATIC MALIGNANCY IN PREGNANT WOMEN. *(E.)* Purtilo, D. T.; Clark, J. V.; Williams, R. (Armed Forces Inst. Pathol., Washington, D.C.). *Am. J. Obstet. Gynecol.* 121(1):41-44, 1975.

The occurrence of 2 cholangiocarcinomas and 2 hepatocellular carcinomas in 4 women (aged 25-37 yr) is described. Three died while pregnant and another died 2 months postpartum. The clinical signs and symptoms seen in these 4 patients were similar to manifestations of other diseases of the liver occurring during pregnancy. Even so, antemortem diagnoses were obtained in 3 of the cases. In the postpartum patient, radiographic evidence of metastases to the lungs, a positive pregnancy test, and carcinoma in a hepatic biopsy specimen led to the erroneous clinical and pathologic diagnosis of metastatic cholangiocarcinoma and a panhysterectomy was performed. It is urged that the physician be aware that other malignant neoplasms besides trophoblastic neoplasia may produce chorionic gonadotropin. In normal pregnancies, maternal serum contains 53 to 500 ng/ml alpha-fetoprotein (AFP), and with fetal death *in utero* this level may rise to 9 μg/ml. The finding of 20 to 25 μg/ml AFP in the serum of 1 patient, in the absence of intrauterine death, indicated a diagnosis of hepatocellular carcinoma rather than feto-maternal passage of AFP. The occurrence of primary hepatic malignancy in the 4 pregnant women does not negate the potential role of androgenic steroids in hepatocarcinogenesis, but these occurrences are contrary to the observation that liver-cell carcinoma requires an androgenic environment. Cirrhosis was present in only 1 of these patients; none was American or British white. Tests for HB-Ag and antibody were performed in only 1 patient, and the serum was positive for the HB antibody. However, this patient had previously received blood transfusions 2 yr prior to the appearance of hepatocellular carcinoma, which may be the explanation. It is suggested that the incidence of pregnancy in one of these 4 women, with its resultant immunological surveillance suppression, may have allowed the tumor-host balance in her to be tipped so that a hepatocellular carcinoma which had been dormant for 11 yr, could progress. However, it is also suggested that this could have been an entirely new tumor.

1325 EICOSATRIENOIC ACID $\omega 9$ IN SERUM LIPIDS OF PATIENTS WITH HEPATOCELLULAR CARCINOMA. *(E.)* Okazaki, N.; Araki, E. (Natl. Cancer Cent. Hosp., Tokyo, Japan). *Clin. Chim. Acta* 53(6237):11-21, 1974.

Serum lipids were analyzed for eicosatrienoic acid $\omega 9$ ($20{:}3\omega 9$) content in 24 patients with hepatocellular carcinoma, 14 with metastatic liver carcinoma, and 10 with liver cirrhosis. Eicosatrienoic acid $\omega 9$ was identified through the use of argentation thin-layer chromatography followed by hydrogenation and a combination of gas liquid chromatography and mass spectrometry of the trimethylsilyoxy derivatives of the methyl esters. Sera from 9 patients in the 1st group were positive for $20{:}3\omega 9$ (37.5%). This fatty acid was not detected in the sera of patients with metastatic liver carcinoma, cirrhosis, or healthy controls. Sera positive for eicosatrienoic acid $\omega 9$ were also positive for α_1-fetoprotein (47.4%). No eicosatrienoic acid $\omega 9$ was found in the sera negative for α_1-fetoprotein. The acid was also observed in the primary liver tumor and the tumor metastatic to the lung in 1 patient with hepatocellular carcinoma. There are differences between the fatty acid composition of the liver and that of the lung, but the fatty acid composition was identical in both tumors when $20{:}3\omega 9$ was present.

ere was no deficiency of essential fatty acids in ose cases that were positive for eicosatrienoic acid . Essential fatty acid components (percentage lues) of serum lipids were significantly higher in e 20:3ω9-positive group than in the negative cases, d the positive cases had no marked essential fatty id deficiency. The deficiency may not be the factor using the appearance of 20:3ω9 in serum of patients th hepatocellular carcinoma. A local deficiency y be a factor leading to the presence of 20:3ω9 in pidly growing tumor tissue. Eicosatrienoic acid ω9 s observed only in tumor tissue; it was not present non-invasive cirrhotic liver, lung, spleen, heart scle, skeletal muscle, pancreas, intestine, kidney d adipose tissue. The limited distribution of this tty acid suggests the presence of altered fatty id metabolism and the synthesis of eicosatrienoic id ω9 in tumor tissue of hepatocellular carcinoma.

26 GASTRIC CANNONBALLS: A ROENTGEN SIGN OF HEPATIC METASTASES. A CASE REPORT. *(E.)*

ss, J. C.; Ferrucci, Jr., J. T. (Massachusetts Gen. sp., Boston). *Gastroenterology* 67(3):519-520, 1974.

case history illustrating an unusual appearance of ltiple cannonball-like defects on the stomach durg conventional barium meal study is presented. The tient was a 74-yr-old Caucasian female who was well til 4 weeks before hospitalization when she began experience intermittent episodes of nausea and miting. Preliminary plain film study of the abdo- n showed enlargement of the liver extending into e left upper quadrant. There were multiple per- stent rounded filling defects within the body of e stomach. A subsequent 99^{m} technitium hepatic an showed marked hepatomegaly and multiple discrete ace-occupying defects consistent with metastatic sease. The patient died 14 days after hospital ad- ssion. Postmortem examination revealed that the ver weighed 3100 g and contained innumerable meta- atic nodules of undifferentiated carcinoma. Sever- tumor nodules had invaded the serosa of the sto- ch, thereby fixing that organ to the liver and se- ral other nodules projected into the gastric wall thout frank fixation. Undifferentiated carcinoma s also found within the left kidney. Contrary to st cases of abnormal liver disease, in this in- ance, a silent primary tumor, occult even at necrop- , allowed progressive liver involvement requiring spitalization only 2 weeks before death.

27 CASE REPORT. HEREDITARY RECURRENT CHOLESTASIS WITH LYMPHOEDEMA -- TWO NEW FAMILIES.

) Aagenaes, O. (Univ. Hosp., Oslo, Norway). *Acta ediatr. Scand.* 63(3):465-471, 1974.

e clinical course and liver histology of 2 new ses of hereditary, neonatal cholestasis with priy lymphoedema at birth or later are described. e 2 patients were unrelated. Both had neonatal rahepatic cholestasis, in 1 lasting for at least yr, in the other only about 6 months. Lympho- ema was severe in the first case and more moderate the latter. Liver histology showed giant cell nsformation in infancy and some fibrosis or cirrhosis in later childhood. In the first family, 3 of 6 siblings were similarly affected at birth, and in the other family, the parents were related, supporting an earlier theory of an autosomal, recessive heredity as the etiology of this condition.

1328 MONOHYDROXY BILE ACIDS IN PLASMA IN INTRAHEPATIC CHOLESTASIS OF PREGNANCY. IDENTIFICATION BY COMPUTERIZED GAS CHROMATOGRAPHY-MASS SPECTROMETRY.

(E.) Back, P.; Sjovall, J.; Sjovall, K. (Dep. Chem., Karolinska Inst., Stockholm, Sweden). *Med. Biol.* 52(1):31-38, 1974.

A detailed study of bile acids in plasma from normal pregnant women and from pregnant women with intrahepatic cholestasis was conducted using a method involving rapid computer evaluation of gas chromatographic-mass spectrometric analysis of sulfated and non-sulfated conjugated bile acid fractions. Total cholic, chenodeoxycholic and deoxycholic acids from pooled plasma samples from 30 healthy pregnant females were 1.10, 0.73 and 0.39 μg/ml, resp. Comparable values calculated from a pooled plasma sample from 8 pregnant patients with cholestasis were elevated at 7.90, 3.60 and 1.40 μg/ml, resp. Most of the bile cholic, chenodeoxycholic and deoxycholic acids were present in the non-sulfated fraction. In addition, the sulfated fraction contained lithocholic (0.19-0.41 μg/ml), 3β-hydroxy-5-cholenoic (0.06-1.28 μg/ml) and ursodeoxycholic (0.026 μg/ml) acids. Of these, only lithocholic acid (0.05 μg/ml) was found in pooled plasma from healthy pregnant females. The highest lithocholic acid concentration (0.65 μg/ml) was present in a woman without cholestasis who later gave birth to a child who developed severe transient neonatal jaundice of unknown etiology. It thus seems possible that the concentrations of lithocholic and 3β-hydroxy-5-cholenoic acids in maternal plasma are partly determined by the functional state of the fetal liver.

1329 OCCURRENCE OF HEPATIC IMPAIRMENT IN WOMEN JAUNDICED BY ORAL CONTRACEPTIVES AND IN THEIR MOTHERS AND SISTERS.

(E.) Dalen, E.; Westerholm, B. (Natl. Board Health Welfare, Stockholm, Sweden). *Acta Med. Scand.* 195(6):459-463, 1974.

A questionnaire survey was conducted in Sweden to determine whether women with jaundice from oral contraceptives, and their mothers and sisters, differed from control women who had used oral contraceptives for at least 2 yr without adverse reactions and their mothers and sisters. On receipt of the completed questionnaires, the patients and controls were matched so that the parity was the same as was the yr of birth ± 2 yr. This matching operation produced 129 matched pairs. The patients had experienced pruritus and jaundice during pregnancy more often than the controls. The patient group also showed a higher incidence of hepatitis, gallstone symptoms and cholecystectomy. The patients' mothers had experienced pruritus during pregnancy to a greater extent than their controls. The patients' sisters showed a significantly higher incidence of pruritus during pregnancy and oral contraceptive treatment than their controls. Gallstone symptoms and cholecystectomy were also found more often in the group of the patients' sisters. The results support the hypothesis than genetic factors play a part in the occurrence of jaundice during oral contraception and late pregnancy. The investigation also indicates that patients with jaundice due to oral contraceptive treatment must be considered as high risk patients with regard to their proneness to develop gallbladder disease.

1330 FACTORS INFLUENCING MORTALITY IN THE TREATMENT OF PYOGENIC HEPATIC ABSCESS.

(E.) Pitt, H. A.; Zuidema, G. D. (John Hopkins Hosp., Baltimore, Md.). *Surg. Gynecol. Obstet.* 140(2):228-234, 1975.

Eighty cases of pyogenic abscess, observed over a period of 21 years, were reviewed to better define factors associated with mortality. It was noted mortality jumped from 57% to 81% as age of 70 yr was passed. Laboratory data associated with high mortality were elevated bilirubin, or SGOT levels, albumin levels less than 3.0 g%, and polymorphonuclear neutrophil leukocyte levels over 80%. Mortality was higher (88%) in patients with multiple abscesses than in those with single abscesses (31%), and significantly higher in cases of biliary origin. Another possible factor in high mortality was the presence of multiple organism infections, although the results were not significant. Of 39 patients receiving no or partial treatment (either antibiotic or surgical) 97% died, 20% of them before therapy could be given. In the 41 patients receiving both antibiotic and surgical treatment, 34% died. Seventy-one percent of these deaths had multiple abscesses. Complications, especially those accompanied by bacteremia, raised mortality. It was also noted that over the 21 yr the percentage of women and of older patients had increased. Factors influencing mortality were thus: age over 70 yr, multiple abscesses, biliary origin, associated malignancy, elevated SGOT level, hypoalbuminemia, polymorphonucleocytosis, bacteremia, aerobic infections, and pulmonary, peritoneal, or other significant complications.

1331 REYE'S SYNDROME IN THREE ISRAELI CHILDREN. POSSIBLE RELATIONSHIP TO WARFARIN TOXICITY.

(E.) Mogilner, B. M.; Freeman, J. S.; Blashar, Y.; Pincus, F. E. (Barzilai Med. Cent., Ashkelon, Israel). *Isr. J. Med. Sci.* 10(9):1117-1125, 1975.

Three fatal cases of Reye's syndrome were studied to establish the possible etiological importance of 3-(α-acetonylbenzyl)-4-hydroxycoumarin (Warfarin) used as a rodenticide and an anticoagulant. All 3 (a 3 yr old boy and girl and a 2 yr old boy) displayed the clinical symptoms of the syndrome including "coffee-ground vomiting," clouding of consciousness and convulsions. Autopsy findings confirmed the diagnosis and showed fatty degeneration of the liver and kidney and, in at least 1 case, the myocardium. There was also brain edema with no specific inflammation. In 2 of the children, the hydroxycoumarin was definitely implicated. Two were from the same village, but no toxicological studies were made. It is concluded that Warfarin may be a new etiological factor in Reye's syndrome.

1332 NEW OBSERVATIONS IN THE CLINICAL SPECTRUM THE BUDD-CHIARI SYNDROME.

(E.) Schramek, A.; Better, O. S.; Brook, J. G.; Alroy, G. G.; Gelle B. (Rambam Gov. Hosp., Haifa, Israel). *Ann. Surg.* 180(3):368-372, 1974.

Three case histories are used to present some observations on the natural history, surgical management, and metabolic phenomena in Budd-Chiari syndrome. In one patient side-to-side portacaval shunt brought improvement with asymptomatic follow-up for 5 yr. The patient died of causes unrelated to Budd-Chiari syndrome. At postmortem, the shunt was patent and normal liver architecture was preserved. The second patient presented with a fulminant course culminating in acute hepatorenal syndrome. There was marked hypofibrinogenimia and extreme elevation of SGOT. The normal thrombocyte count as well as the normal level fibrin degradation products suggested reduced fibrinogen production by the liver as the cause of hypofibrinogenimia. Emergency portacaval shunt was follow by improvement in liver status but the patient died of respiratory complications on the 8th postoperativ day. The third patient was on conservative treatmen only and remained well for 20 months at which time progression of the hepatic vein thrombosis was diagnosed and immediate operative decompression of the liver was advised. The patient refused surgery for some time and died following an emergency portacaval shunt operation. In this patient excessive renal tubular reabsorption of sodium at a distal site was documented. This may explain the generalized edema formation in patients with Budd-Chiari syndrome even without inferior vena cava obstruction.

1333 HYPERTRIGLYCERIDAEMIA SECONDARY TO LIVER DISEASE.

(E.) Muller, P.; Fellin, R.; Lambrecht, J.; Agostini, B.; Wieland, H.; Rost, W.; Seidel, D. (Univ. Med. Clin., Heidelberg, Germany). *Eur. J. Clin. Invest.* 4:419-428, 1974.

An abnormally large (300-700 Å), triglyceride rich, low density lipoprotein (density, 1.019-1.063 g/ml) was identified, isolated, and characterized from the plasma of 15 of 22 patients with hypertriglyceridemia secondary to liver disease and designated β_2-lipoprotein. On the basis of its immunoelectrophoretic pattern, β_2-lipoprotein could not be identified in liver disease patients without hypertriglyceridemia. Immunoelectrophoretic analysis of the patients' low density lipoprotein serum fraction in 1% agar gel, indicated 3 different lipoprotein compounds in contrast to 1 lipoprotein in the serum low density lipoprotein fraction of healthy controls. These 3 lipoproteins were separated and isolated using a combination of ultracentrifugation, cold ethanol fractionation, and affinity chromatography with specific antibodies and were found to be 1) the lipoprotein characteristic of cholestasis (lipoprotein-X), 2) normal β-lipoprotein, and 3) β_2-lipoprotein. The immunological properties of isolated β_2-lipoprotein were ested by double immunodiffusion and immunoelectrohoresis; it never reacted with antibodies to human lbumin or human globulins and no constant immunoeaction was obtained with anti-apo A serum. Each of different preparations, however, showed a precipitin ine in identity with antibodies to apo-B and apo-C n both double immunodiffusion and immunoelectrohoresis, indicating that these 2 apo-lipoproteins ake part in the structure of this plasma lipoprotein. his possibility is supported by the results of a ietary experiment in which β_2-lipoprotein concentraion decreased in the plasma of patients on a low fat iet. It is suggested that β_2-lipoprotein is a deradation product or intermediate particle of chyloicron metabolism and that one significant mechanism esponsible for its accumulation in this disease is he markedly reduced hepatic lipase activity demontrated in these patients.

334 LIVER DISEASE IN PATIENTS WITH JOINT SYMPTOMS. *(E.)* Hilton, A. M.; Boyes, B. E.; mith, P. J.; Sharp, J.; Dymock, I. W. (Univ. Hosp. outh Manchester, England). *Ann. Rheum. Dis.* 33(6): 40-547, 1974.

he results of detailed hepatic investigations are eported for 30 patients who presented with joint ymptoms over a 2-yr period at a rheumatology clinic, nd who were found on routine clinical examination or iochemical screening to have hepatomegaly and/or bnormal routine liver function tests. In 20 patients, specific hepatic disorder was found and a varied pectrum of liver disease revealed. The diagnoses ncluded alcoholic liver disease (3 patients), drugnduced liver damage (3), primary biliary cirrhosis 3), chronic persistent hepatitis (3), chronic active epatitis (2), polyarteritis nodosa, sarcoidosis, ardiac cirrhosis, and severe fatty change (1 each). n 10 patients no definite diagnosis was reached to xplain the hepatic abnormalities. In the 3 patients ith drug-induced liver damage, the disturbances of iver function were attributable to drug therapy (inomethacin or azathioprine) which resolved when the rugs were withdrawn, illustrating the importance of rug toxicity as a cause of liver abnormalities in atients with rheumatological disorders. It is sugested that detailed hepatic investigations are justiied in patients with rheumatic disorders who have epatomegaly and/or abnormal routine liver function ests; such investigations may reveal a variety of ubclinical liver diseases, some of which may be reatable or reversible.

335 HEPATIC AND SPLENIC LYMPHANGIOMATOSIS WITH SKELETAL INVOLVEMENT: REPORT OF A CASE ND REVIEW OF THE LITERATURE. *(E.)* Asch, M. J.; ohen, A. H.; Moore, T. C. (Harbor Gen. Hosp., orrance, Calif.). *Surgery* 76(2):334-339, 1974.

case of lymphangiomatosis with hepatic and splenic alcifications is presented. A laparotomy was perormed on a 10-yr-old girl with hepatosplenomegaly nd lytic lesions of the 2nd and 4th ribs. An nlarged spleen was removed that contained cysts illed with amorphous eosinophilic debris, cholesterol crystals, calcium, and hemosiderin. The enlarged liver was diffusely cystic for 60% of the parenchyma with normal tissue intervening. The postoperative course was uncomplicated. After 1 yr of follow-up, the patient remains active and well; the liver size is unchanged as per physical examination; scan and liver chemistries remain normal, and skeletal lesions are unchanged. Prognosis is poor for those patients who have liver and/or spleen involvement along with skeletal angiomatosis and in patients with cystic lymphangiomatosis involving nonintegumental extraskeletal structures. Cystic lymphangiomatosis is likely to be progressive; if there is only limited liver involvement, surgical removal is to be considered. With diffuse disease, there may be little to offer, e.g., transplantation.

1336 BILE ACID METABOLISM AND HEPATIC DISEASE FOLLOWING SMALL BOWEL BYPASS FOR OBESITY. *(E.)* Sherr, H. P.; Nair, P. P.; White, J. J.; Banwell, J. G.; Lockwood, D. H. (Johns Hopkins Univ. Sch. Med., Baltimore, Md.). *Am. J. Clin. Nutr.* 27(12): 1369-1379, 1974.

A possible relation of altered bile acid metabolism to liver disease following jejunoileal bypass for morbid obesity was investigated in 5 patients, 2 men and 3 women aged 23-36 yr. In the 4 months after operation, the patients lost from 68 to 107 pounds each. In all patients prior to operation, liver function tests, as well as prothrombin time, fecal fat and carotene were essentially normal. At 4 months postoperatively, there was steatorrhea, diarrhea, abnormal absorption of B_{12} and D-xylose, a fall in serum cholesterol and carotene, impaired liver function, significant hepatic steatosis, and in 1 patient, the appearance of stellate fibrosis. The relative percentages of bile acids in bile were unaltered, but in 3 patients there was a postoperative increase in the ratio of glycine to taurine bile acid conjugates. These latter changes could not be explained by a taurine deficiency, as plasma taurine levels were unchanged. In 4 patients marked elevation in serum bile acids occurred postoperatively, predominantly in cholic acid and chenodeoxycholic acid. In the 1 patient who developed progressive fibrosis, serum cholic acid was increased 192-fold, chenodeoxycholic acid 195-fold and lithocholic acid 14-fold. However, biliary lithocholic acid in this patient was entirely in the water-soluble and presumbably rapidly excretable sulfated form, factors which rule against the pathophysiological role of lithocholic acid in the development of liver disease. Analysis of bile acids in this patient's liver revealed an absence of lithocholic acid and an elevation in chenodeoxycholic acid to levels known to cause hepatic injury. From these studies it appears that altered bile acid metabolism is not the sole factor responsible for all of the hepatic changes following surgery. It is proposed, however, that increased levels of chenodeoxycholic acid in association with protein malnutrition may be responsible for postoperative hepatic fibrosis. It is recommended that periodic liver biopsies be employed in patients such as these to ensure proper follow-up.

1337 CLINICAL APPLICATION OF CYTOCHROME A(+A$_3$) ASSAY OF MITOCHONDRIA FROM LIVER SPECIMENS: AN AID IN DETERMINING METABOLIC TOLERANCE OF LIVER REMNANT FOR HEPATIC RESECTION. *(E.)* Ozawa, K.; Yamaoka, Y.; Kitamura, O.; Nambu, H.; Kamiyama, Y.; Takeda, H.; Takasan, H.; Honjo, I. (Fac. Med., Kyoto Univ., Japan). *Ann. Surg.* 180(6):868-876, 1974.

Measurement of cytochrome a(+a$_3$) contents in liver mitochondria was made on 52 biopsy specimens of patients with liver tumor. Seventeen patients had primary tumors of the liver. The others had secondary tumors arising from the stomach, 23; colon and rectum, 5; pancreas, 6; and gallbladder, 1. There were 36 men and 16 women, aged 8 months to 72 yr. Of these 52 patients, 12 had undergone liver resection for cancer, including 3 extended right hepatectomies. Patients having higher cytochrome a(+a$_3$) contents in mitochondria from remaining liver than those of normal human liver mitochondria adequately survived major liver resections whether or not associated with liver cirrhosis. However, patients with cytochrome a(+a$_3$) contents less than 0.5×10^{-10} M/mg protein showed a high rate of postoperative complication (80%) and death (40%) in spite of minor operation. In routinely used liver function tests such as serum albumin, albumin:globulin ratio, SGOT, total bilirubin, prothrombin time, BSP, and thymol turbidity test, there were no significant differences between patients with cytochrome a(+a$_3$) contents more than 0.5×10^{-10} M/mg protein and those less than 0.5. These results indicate that routine laboratory studies do not bear much diagnostic value in estimating a marked decrease of mitochondrial cytochrome a(+a$_3$) contents. It is suggested that the measurements of cytochrome a(+a$_3$) of the remnant liver should be done prior to a contemplated major resection.

1338 EXCHANGE TRANSFUSION IN HEPATIC COMA: FACTORS AFFECTING RESULTS, WITH LONG-TERM FOLLOW-UP DATA. *(E.)* Lewis, J. D.; Hussey, C. V.; Varma, R. R.; Darin, J. C. (Med. Coll. Wisconsin, Milwaukee). *Am. J. Surg.* 129(2):125-129, 1975.

Exchange transfusion as a therapeutic measure in fulminant hepatic failure was studied in 19 patients aged 7-71 of both sexes. Twelve had infectious hepatitis, 2 had Laennac's cirrhosis, 2 had postoperative complications, and 1 each had serum hepatitis, isoniazid hepatitis, and avascularnecrosis. Arteriovenous shunts were used, except in children too small for arterial lines, in which case venovenous exchanges were used. The active rate of exchange averaged 200 cc/min, but the total time involved was 3-4 hr. Each patient's blood volume was determined with a double tag radioisotope technique, using ^{151}Cr and radioiodinated serum albumin. The exchange volume was 150% of the calculated blood volume. Survival over 2 weeks was considered to constitute response to therapy; response rate was 42%. A 4-5 year follow-up on the patients who survived showed no apparent sequelae. Of the 4 who survived, 3 had infectious hepatitis, and 1 Laennac's cirrhosis. Mortality among the others was mainly due to sepsis. Two biochemical changes were observed 6 hr after exchange: rebound of serum bilirubin and a serum ammonia level over 200 μg/100 ml which indicated a grave prognosis. The results do not indicate that exchange transfusion is the answer to therapy of fulminant hepatic failure; the therapy is, however, of prognostic value.

1339 CORTICOSTEROIDS, ANTIMETABOLITES, AND THE LIVER. *(Sp.)* Rull Segura, S. (Fac. Med., Univ. Navarra, Pamplona, Spain). *Rev. Esp. Enferm. Apar. Dig.* 44(4):409-420, 1974.

1340 BLOOD IMMUNOGLOBULIN (IgA, IgG, AND IgM) LEVELS AND LIVER DISEASE. *(It.)* Squadrito, G.; Ceruso, D.; Quartarone, M.; Monacciani, U. (Inst. Med. Symptomatol., Univ. Messina, Italy). *Boll. Soc. Ital. Biol. Sper.* 49(21):1260-1264, 1973.

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1343 HETEROTOPIC TRANSPLANTATION OF THE LIVER. *(Fr.)* Geaudoin, J. G.; Maclean, L. D. (Dep. Surg., McGill Univ., Montreal, Canada). *Union Med. Can.* 103(12):2110-2115, 1974.

1344 SERUM MIGRATION INHIBITORY ACTIVITY IN PATIENTS WITH POSTTRANSPLANTATION HEPATIC DYSFUNCTION. *(E.)* Torisu, M.; Yoshida, T.; Cohen, S. (Univ. Connecticut Health Cent., Farmington). *Clin. Immunol. Immunopathol.* 3(3):369-376, 1975.

1345 MAJOR HEPATIC RESECTIONS IN CHILDREN. *(E.)* Stone, H. H. (Emory Univ. Sch. Med., Atlanta, Ga.). *J. Pediatr. Surg.* 10(1):127-134, 1975.

1346 INFLUENCE OF LIVER RESECTION ON SOME CHARACTERISTICS OF LIVER FUNCTION. *(Rus.)* Zhuravlev, V. A.; Voronchikhina, L. D.; Vasilev, P. N.; Korepanov, V. I.; Shestakova, E. V. (Kirovsk Res. Inst. Blood Transfus., USSR). *Sov. Med.* (12):85-88, 1973.

1347 THERAPY OF ACUTE LIVER INSUFFICIENCY. *(Ger.)* Meyer zum Buschenfelde, K. H. (2nd Med. Clin., Univ. Mainz, Germany). *Langenbecks Arch. Chir.* 337:235-243, 1974.

1348 CONJUGATION OF ^{14}C-CHOLIC ACID IN PATIENTS WITH FULMINANT HEPATIC FAILURE. *(E.)* Horak, W.; Murray-Lyon, I. M.; Waldram, R.; Williams, R. (King's Coll. Hosp., London, England). *Digestion* 10(4/5):356-357, 1974.

1349 CALCIFIED MIXED MALIGNANT TUMOR OF THE LIVER. *(E.)* Ludwig, J.; Grier, M. W.; Hoffman, II, H. N.; McGill, D. B. (Mayo Clin., Rochester, Minn.). *Arch. Pathol.* 99(3):162-166, 1975.

1350 ASSOCIATION OF HEPATOMA AND AUSTRALIA ANTIGEN: ONE CASE STUDIED BY ELECTRON MICROSCOPY AND IMMUNOFLUORESCENCE. *(Fr.)* Bodin, F.; Scotto, J.; Homberg, J. C.; Lichtenstein, H.; Roudier, M.; Huguet, C. (St. Antoine Hosp., Paris, France). *Nouv. Presse Med.* 3(38/40):2487-2489, 1974.

1351 DIARRHEA SYNDROME IN HEPATIC ADENOMA. *(E.)* Minow, R. A.; Tompkins, R. K.; Gitnick, G. L. (Univ. California Los Angeles Cent. Health Sci.). *Am. J. Dig. Dis.* 20(2):182-186, 1975.

1352 HAEMOPERITONEUM COMPLICATING THOROTRAST-INDUCED HAEMANGIOENDOTHELIOMA OF THE LIVER. *(E.)* Campbell, I. W.; Webb, J. N. (R. Infirm., Edinburgh, Scotland). *J. R. Coll. Surg. Edinb.* 19(4): 233-237, 1974.

1353 PROTRACTED COURSE OF PRIMARY CANCER OF THE LIVER. *(Rus.)* Piatak, O. A.; Simbiriakova, K. I.; Polischuk, M. L. (A. M. Gorky Med. Inst., Donetsk, USSR). *Ter. Arkh.* 46:91-93, 1974.

1354 PRIMARY TUMORS AND MALFORMATIVE CYSTS OF THE LIVER IN ADULTS. *(Fr.)* Lanitis, G.; Heredia, A.; Ryncki, P. V. (Inst. Pathol., Univ. Lausanne, Switzerland). *Helv. Chir. Acta* 41(5/6): 715-723, 1974.

1355 COMBINED CHEMOTHERAPY AND SURGERY IN THE TREATMENT OF PRIMARY AND SECONDARY LIVER TUMORS. *(Fr.)* Morgenthaler, F. R.; Pettavel, J. (no affil.). *Helv. Chir. Acta* 41(5/6):725-731, 1974.

1356 PARTIAL HEPATECTOMY FOR HEPATIC METASTASES. *(Ger.)* Wanger, F. (Inselspital, Bern, Switzerland). *Helv. Chir. Acta* 41(5/6):733-738, 1974.

1357 DISSEMINATED INTRAVASCULAR COAGULATION AND FATAL THROMBOSIS IN A PATIENT WITH CARCINOMA OF THE BILIARY TRACT. *(Ger.)* Kunz, F.; Amor, H.; Hortnagl, H.; Wesier, G.; Holzknect, F.; Braunsteiner, H. (Med. Clin., Univ. Innsbruck, Austria). *Dtsch. Med. Wochenschr.* 99(52):2643, 1974.

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1359 LIPIDS OF CULTURED HEPATOMA CELLS: V. DISTRIBUTION OF ISOMERIC MONOENE FATTY ACIDS IN INDIVIDUAL LIPID CLASSES. *(E.)* Wood, R.; Falch, J.; Wiegand, R. D. (Univ. Missouri Sch. Med., Columbia). *Lipids* 9(12):987-992, 1974.

1360 SURGICAL TREATMENT OF TRAUMATIC RUPTURE OF THE LIVER. *(Ger.)* Bekier, J.; Gonzenbach, H. (Uster Reg. Hosp., Switzerland). *Helv. Chir. Acta* 41(4):505-512, 1974.

1361 SURGERY FOR COARCTATION OF THE INFERIOR VENA CAVA ASSOCIATED WITH BUDD-CHIARI SYNDROME. *(Rus.)* Pokrovskii, A. V.; Apsatarov, E. A.; Kiiashko, V. A.; Krestinskaia, N. N. (A. N. Bakulev Inst. Cardiovasc. Surg., Moscow, USSR). *Vestn. Khir.* 113(9):18-23, 1974.

1362 ACCUMULATION OF OXYGENATED STERYL ESTERS IN WOLMAN'S DISEASE. *(E.)* Assmann, G.; Fredrickson, D. S.; Sloan, H. R.; Fales, H. M.; Highet, R. J. (Natl. Heart Lung Inst., Bethesda, Md.). *J. Lipid Res.* 16(1):28-38, 1975.

1363 DEFECTIVE BILE ACID SYNTHESIS IN CEREBROTENDINOUS XANTHOMASTOSIS. *(E.)* Salen, G.; Shefer, S.; Tint, G. S.; Setaguchi, T.; Mosbach, E. H. (VA Hosp., East Orange, N.J.). *Gastroenterology* 67(4):825, 1974.

1364 INTRAHEPATIC CHOLESTASIS OF PREGNANCY. *(Ger.)* Krejs, G. J.; Blum, A. L. (Triemli Munic. Hosp., Zurich, Switzerland). *Munch. Med. Wochenschr.* 116(51/52):2237-2242, 1974.

1365 INTRAHEPATIC CHOLESTATIS. *(Ger.)* Beran, R. (Prov. Hosp., Graz, Austria). *Wien. Med. Wochenschr.* (suppl. 22):3-16, 1974.

1366 RHEOGRAPHY OF THE LIVER IN CHILDREN WITH LEUKEMIA. *(Rus.)* Podgalo, D. A. (Inst. Pediatr., Moscow, USSR). *Pediatriia* 8:20-23, 1974.

1367 SOME ENZYMOLOGICAL CRITERIA IN SERA FROM CHILDREN WITH VARIOUS LIVER DISEASES AND ACUTE LEUKEMIA. *(Rus.)* Vaganov, P. D.; Zubikova, I. I. (N. I. Pirogov 2nd Moscow Med. Inst., USSR). *Pediatriia* (8):23-26, 1974.

See also, 1002, 1029, 1143, 1144, 1145, 1149, 1179, 1180, 1181, 1182, 1183, 1185, 1186, 1187, 1188, 1189, 1190, 1191, 1192, 1193, 1194, 1195, 1200, 1201, 1202, 1402, 1429, 1435, 1438, 1439, 1468, 1486, 1501, 1537, 1585, 1586, 1591, 1592, 1596.

LIVER AND BILIARY TRACT

Hyperbilirubinemic States

1368 α_1-FETOPROTEIN IN SEVERE NEONATAL JAUNDICE. *(It.)* Gravina, E.; Gravina-Sanvitale, G. (Cologna Veneto Gen. Reg. Hosp., Verona, Italy). *Fegato* 19(2):205-210, 1973.

1369 DIAGNOSIS OF JAUNDICE RESULTING FROM A CONGENITAL ENZYME DEFICIENCY OF LIVER CELLS. *(Fr.)* Magnenat, P.; Okolicsanyi, L. (Dep. Med., Univ. Lausanne, Switzerland). *Fegato* 19(2): 343-351, 1973.

1370 NEONATAL JAUNDICE AND THE DIFFERENTIAL DIAGNOSIS OF NEONATAL HEPATOSPLENOMEGALY. *(Ger.)* Bachmann, K. D. (Pediatr. Clin., Westphalian Wilhelms Univ., Munster, Germany). *Geburtshilfe. Frauenheilkd.* 34(8):597-606, 1974.

1371 CHRONIC HYPERBILIRUBINEMIA IN CHILDREN AND ADULTS DUE TO A CONGENITAL GLUCURONYL TRANSFERASE DEFICIENCY. *(It.)* Gentilini, P.; Ciampolini, M.; Bartolozzi, G.; Surrenti, C. (Inst. Clin. Gen. Med., Med. Ther., Univ. Florence, Italy). *Fegato* 19(2):443-456, 1973.

1372 CONGENITAL IMPAIRMENT OF THE MECHANISM BINDING BILIRUBIN TO GLUCURONIC ACID (CRIGLER-NAJJAR AND RELATED SYNDROMES). *(It.)* Teodori, U. (Inst. Med. Clin., Univ. Florence, Italy). *Fegato* 19(2):435-442, 1973.

1373 GILBERT'S SYNDROME AND VITAMIN K-DEPENDENT CLOTTING FACTORS. *(It.)* Ninno, E. D.; Ideo, G.; Mannucci, P. M. (Inst. Spec. Med. Pathol., Milan, Italy). *Fegato* 19(2):429-434, 1973.

1374 CHANGES IN BILIRUBIN CLEARANCE FOLLOWING PHENOBARBITAL TREATMENT IN PATIENTS WITH GILBERT'S SYNDROME AND OTHER FORMS OF HYPERBILIRUBINEMIA. *(It.)* Surrenti, C.; Chirantini, E.; Salvadori, G.; Casini, M. C.; Buzzelli, G.; Gentilini, P. (Inst. Clin. Gen. Med., Univ. Florence, Italy). *Fegato* 19(2):401-409, 1973.

1375 PHARMACOLOGICAL EFFECTS ON AND BILIRUBIN METABOLISM IN THE LIVER: BILIARY EXCRETION AND MICROSOMAL ENZYME INDUCTION. *(It.)* Messini, M.; Grossi, F.; Messina, B. (Sch. Spec. Liver Metab. Dis., Rome, Italy). *Fegato* 19(2):273-291, 1973.

1376 SYNTHESIS AND PLASMA TRANSPORT OF BILIRUBIN *(It.)* Perona, G. (Inst. Med. Clin., Univ. Padua, Verona, Italy). *Fegato* 19(2):93-107, 1973.

1377 DRUGS AND CHEMICALS WHICH INTERFERE WITH BILIRUBIN METABOLISM. *(It.)* Cugurra, F. (Inst. Pharmacol. Pharmacog., Univ. Genoa, Italy). *Fegato* 19(2):211-223, 1973.

See also, 1088, 1455.

LIVER AND BILIARY TRACT

Nonviral Hepatitis and Hepatic Injury

1378 THE LIVER IN BOUTONNEUSE FEVER. *(E.)* Guardia, J.; Martinez-Vazquez, J. M.; Moragas, A.; Rey, C.; Vilaseca, J.; Tornos, J.; Beltran, M.; Bacardi, R. (Munic. Soc. Welfare Hosp., Barcelona, Spain). *Gut* 15(7):549-551, 1974.

Hepatic lesions were studied in 13 cases of boutonneuse fever (Mediterranean exanthematous fever). SGOT values were elevated in 8 patients, SGPT values in 10 patients, alkaline phosphatases in 7 patients, and conjugated bilirubin in 3 patients. Of 5 patients studied histologically, 3 had lesions of a granulomatous type, 1 fatty degeneration with alcoholism, and the 5th had a normal liver. Two of the three patients with granulomatous lesions showed a moderate increase in alkaline phosphatases, but transaminase values were nearly normal. The hepatic changes had no clinical repercussions. Although no assertions can be made concerning the mechanism that causes the lesions, boutonneuse fever should be included among infectious conditions that can produce granulomas within the liver.

1379 VINYL-CHLORIDE-INDUCED LIVER DISEASE: FROM IDIOPATHIC PORTAL HYPERTENSION (BANTI'S SYNDROME) TO ANGIOSARCOMAS. *(E.)* Thomas, L. B.; Popper, H.; Berk, P. D.; Selikoff, I.; Falk, H. (Natl. Inst. Health, Bethesda, Md.). *N. Engl. J. Med.* 292(1):17-22, 1975.

Histologic examination was made of liver tissue (8 autopsy and 18 biopsy specimens) and 5 spleens from 20 workers who had industrial exposure to vinyl chloride for periods usually exceeding 2 years and extending up to 18 years. Tissue samples were taken from 15 patients with angiosarcoma and 5 with hepatic fibrosis but without angiosarcoma. Three basic patterns were noted in the different parts of the angiosarcomas: the sinusoidal pattern, the papillary pattern, and the cavernous pattern. In addition, 1/4 of the angiosarcomas had more solid nodules of anaplastic sarcoma. In 3 patients, organs other than the liver were involved by angiosarcoma: the duodenum in 1, the lung in another, and the lung, heart, kidney, and lymph nodes in the third. In addition, a peculiar pattern of progressive portal-tract, inconspicuous intralobular and conspicuous capsular fibrosis was observed in the 5 workers without angiosarcoma, in all 7 patients with angiosarcoma from whom tumor-free portions of the liver were available, and in 2 tumor-free biopsies from patients subsequently found to have angiosarcoma. The fibrosis was accompanied by splenomegaly. Hypertrophy and hyperplasia of both hepatocytes and hepatic and splenic mesenchymal cells were also seen. The histologic similarity to chronic inorganic arsenical poisoning, in which angiosarcomas also occur, and to idiopathic portal hypertension (Banti's syndrome) suggests that the latter syndrome at times results from unknown toxic, possibly environmental, chemicals. This study demonstrates a stimulating effect by vinyl chloride or its metabolites on several types of hepatic and splenic cells and suggests a transition from the fibrotic stage to angiosarcoma.

1380 LIVER DISEASE CAUSED BY PROPYLTHIOURACIL. *(E.)* Fedotin, M. S.; Lefer, L. G. (Duke Univ. Med. Cent., Durham, N.C.). *Arch. Intern. Med.* 135(2):319-321, 1975.

A 56 yr old male presented with a 2-yr history of weakness, 50 lb weight loss, insomnia, hyperdefecation, heat intolerance, and severe tremors. He had taken diazepam (5 mg as needed) for several years. Two and a half months prior to admission hyperthyroidism was diagnosed. Alkaline phosphatase value was raised to 5 Bodansky U, and bilirubin value was 1.4 mg/100 ml. He was given propylthiouracil (50 mg, twice/day). During further evaluation, the propylthiouracil was increased to 100 mg, 3 times/day and the diazepam to 5 mg, 4 times/day. At this time the bilirubin value was 2.1 mg/100 ml, alkaline phosphatase level was 395 IU, SGOT 384, SGPT 238 U. After 2 days the bilirubin was 2.0 mg/100 ml, SGOT 596 U, alkaline phosphatase 290 IU. Propylthiouracil therapy was discontinued and a percutaneous liver biopsy was obtained. On the 4th day after discontinuing propylthiouracil therapy the bilirubin level was 0.9 mg/ml, alkaline phosphatase 220 IU, SGOT 89 U, all of which continued to decrease. The histologic and electron microscopic examination of the biopsy material revealed characteristic findings of chronic active (aggressive) hepatitis. The marked increase in liver function test abnormalities, their rapid return to normal, and the close temporal relationship of these changes to manipulations of propylthiouracil therapy suggests that propylthiouracil sensitivity was the likely cause of this patient's liver disease. The continued use of diazepam while the liver function was improving removes this drug from suspicion. It is suggested that propylthiouracil be added to the list of drugs which must be considered in the evaluation of chronic liver disease.

1381 HEPATIC PHARMACOLOGY. *(Fr.)* Arlaud, J. (no affil.). *Marseille Med.* 110(10):763-770, 1973.

1382 LIVER DISEASE AND DRUGS. *(Sp.)* Gonzalez Macias, J.; de Castro del Pozo, S. (Fac. Med., Salamanca, Spain). *Rev. Esp. Enferm. Apar. Dig.* 44(2):175-186, 1974.

1383 LIVER INJURY IN JUVENILE DRUG ADDICTS. *(Ger.)* Brunner, H.; Kroiss, A.; Grabner, G.; Ranefeld, J. (Dep. Gastroenterol., Univ. Vienna, Austria). *Acta Med. Austriaca* 1(2):48-54, 1974.

1384 THE COURSE OF TOXIC HEPATITIS CAUSED BY LONG EXPOSURE TO HEXACHLOROCYCLOHEXANE (HCH) PREPARATIONS. *(Rus.)* Sasinovich, L. M.; Alekhina, S. M.; Odintsova, I. L. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pestic., Polym., Plast., Kiev, USSR). *Vrach. Delo* (10):133-135, 1974.

1385 AN ULTRASTRUCTURAL STUDY OF TETRACYCLINE HEPATOTOXICITY IN MAN. *(E.)* Pittman, F. E.; Ainsworth, S. K.; Hennigar, G. R.; Pittman, J. C. (Med. Univ. South Carolina, Charleston). *Gastroenterology* 67(4):821, 1974.

1386 DRUG-INDUCED LIVER DAMAGE, WITH SPECIAL REFERENCE TO CHANGES AND FUNCTIONAL DISORDERS IN LIVER CELLS AFTER ORAL ADMINISTRATION OF HORMONAL CONTRACEPTIVE DRUGS. *(Pol.)* Raczynska, A. (M. Kopernik Hosp., Torun, Poland). *Patol. Pol.* 25(1):91-100, 1974.

1387 SOME "VIRAL" HEPATITIS IS CAUSED BY RICKETTSIA OR SIMILAR AGENTS. ITS CAUSE SHOULD BE DIAGNOSED SINCE IT IS SENSITIVE TO LARGE ENOUGH DOSES OF BROAD-SPECTRUM ANTIBIOTICS. *(Fr.)* Giroud, P.; Jadin, J. (Pasteur Inst., Paris, France). *Bull. Acad. Natl. Med. (Paris)* 158(1):87-91, 1974.

1388 LIVER DISEASE CAUSED BY CHICKENPOX VIRUS IN CHILDREN WITH LEUKEMIA. *(Rus.)* Talalaev, A. G. (N. I. Pirogov 2nd Moscow Med. Inst., USSR). *Pediatriia* (8):26-31, 1974.

1389 TWO CASES OF ISOLATED TUBERCULOSIS OF THE LIVER. *(Pol.)* Kawecki, J.; Nowoczyn, J. (PCK Nav. Hosp., Gdynia, Poland). *Gruzlica* 41(10): 1083-1088, 1973.

1390 TUBERCULOSIS OF THE LIVER. *(Sp.)* Garcia Ocana, A.; Larranaga Barrera, E.; Candia Sierra, A.; Lopez-Yarto, J. (Gran Hosp. Estado, Madrid, Spain). *Rev. Esp. Enferm. Apar. Dig.* 44(4): 387-400, 1974.

See also, 0923, 1029, 1348, 1377, 1411, 1444.

LIVER AND BILIARY TRACT

Acute Viral Hepatitis

1391 ACUTE VIRAL HEPATITIS: A SURVEY OF 500 PATIENTS. CLINICAL, BIOCHEMICAL, IMMUNOLOGICAL, AND MORPHOLOGICAL FEATURES AT TIME OF DIAGNOSIS. *(E.)* Petersen, P.; Christoffersen, P.; Elling, P.; Juhl, E.; Dietrichson, O.; Faber, V.; Iversen, K.; Nielsen, J. O.; Poulsen, H. (Blegdam Hosp., Copenhagen, Denmark). *Scand. J. Gastroenterol.* 9(7):607-613, 1974.

Data were collected from February, 1969 to June, 1972 on 500 patients (11-85 yr old; 33.6% female, 66.4% male) with biopsy-verified acute viral hepatitis. Histological diagnosis of acute viral hepatitis was made when the following changes were present: focal liver cell necrosis, variation of cells and nuclei, Kupffer cell proliferation, acidophilic bodies, and portal inflammation. Nearly half of the 500 patients had a history of drug abuse. Fifteen percent had visited zones where hepatitis is endemic within 18 weeks prior to onset of symptoms. Blood samples had been drawn in 17% of the patients within 3 months of onset and 1.6% of the patients had received blood transfusion within 6 months prior to onset of symptoms. No source of infection could be determined in about 28% of the cases. In 87% of the patients jaundice was present before biopsy. The remaining 13% had anicteric hepatitis. The liver was enlarged in 27% of the patients, while splenomegalia was found in only 1 case. A variety of extrahepatic disorders were found: 9 patients had collagen disease, 8 had endocrine disease, and 19 had had previous allergic manifestations. The biochemical and immunological features of the 500 patients are tabulated as are the histological features. It is suggested that these results may represent a real profile of acute viral hepatitis in Copenhagen because the 500 cases were unselected and comprise 1/4 of all patients reported to the Ministry of Health during the same period from the same area.

1392 VIRAL HEPATITIS. *(E.)* Purcell, R. H. (Natl. Inst. Allergy Infect. Dis., Bethesda, Md.). *Prev. Med.* 3(4):529-534, 1974.

The discovery of hepatitis B and hepatitis A antigens, and the epidemiology, laboratory study, and prospects for control of both hepatitis A and B are reviewed. At least 4 subtypes of hepatitis B surface antigen have been identified, but it is not clear whether these are reflections of different serotypes of hepatitis B virus or whether infection with 1 subtype stimulates immunity to all the subtypes. The application of sensitive assays for hepatitis B antigen and antibody to epidemiologic studies has revealed that hepatitis B virus infection is widespread throughout many populations and appears to be directly related to age and inversely related to socioeconomic status. Hepatitis B virus has not been unequivocally isolated in tissue or organ culture and serially passaged in such *in vitro* systems, but it has been successfully transmitted to chimpanzees and rhesus monkeys. Three approaches to the control of hepatitis B infection are being studied: 1) interdiction of the spread of hepatitis B virus, 2) passive immunization with hepatitis B immune serum globulin, and 3) active immunization with hepatitis B surface antigen. Hepatitis A antigen, which is morphologically and serologically distinct from hepatitis B antigen, has recently been revealed by immune electron microscopy studies in the stools of patients acutely ill with hepatitis A infection. Preliminary epidemiologic studies suggest that more than 2 hepatitis viruses exist, but proof is lacking for a "hepatitis type C". Hepatitis A virus has not been successfully isolated and cultivated *in vitro* but it has been successfully transmitted to marmosets and chimpanzees. It may be possible to improve the protective effect of immune serum globulin against hepatitis A by selecting lots of γ-globulin rich in antibody to hepatitis A antigen; studies to confirm this have not been carried out.

1393 ON THE TRAIL OF EPIDEMIC HEPATITIS. *(E.)* Zuckerman, A. J. (no affil.). *Nature* 252(5480):193-194, 1974.

Virus-like particles, 27 nm in diameter, were demonstrated by immune electron microscopy in fecal extracts from 2 of 4 volunteers infected by injection or p.o. with the MS-1 strain of hepatitis A virus. The particles were heavily coated with antibody and were aggregated by convalescent serum, by serum from 6 volunteers previously infected with hepatitis A, and by serum from patients with naturally occurring hepatitis A. In another study, fecal extracts obtained 33 days after infection with the MS-1 strain of hepatitis A contained virus-like particles measuring 22, 27, and 30 nm in diameter. This material induced hepatitis in 2 of 6 marmosets, suggesting that hepatitis A virus is indeed present.

1394 THE ROLE OF CIRCULATING HEPATITIS B ANTIGEN/ANTIBODY IMMUNE COMPLEXES IN THE PATHOGENESIS OF VASCULAR AND HEPATIC MANIFESTATIONS IN POLYARTERITIS NODOSA. *(E.)* Trepo, C. G.; Zuckerman, A. J.; Bird, R. C.; Prince, A. M. (New York Blood Cent., N.Y.). *J. Clin. Pathol.* 27(11):863-868, 1974.

To investigate the role of hepatitis B antigen (HB_sAg) and specific immune complexes in polyarteritis, sera from 55 histologically confirmed cases were tested for the presence of hepatitis B antigen-associated particles and hepatitis B-antibody (HB_sAb) by solid phase radioimmunoassay, electron microscopy, and passive hemagglutination. Results of these findings were correlated with the clinical course of the disease. HB_sAg was detected in 30 of 55 patients (54.5%) and HB_sAb in 13 of 45 patients (28%). Subtyping in 10 patients revealed that 11 were Y and 9 D. Thirty-seven cases (69%) demonstrated either HB_sAg or HB_sAb and 5 of 45 (11%) had both. Electron microscopic examination showed 20 nm spherical and tubular particles in sera of 20 of 27 patients with 42 nm particles in 11 cases and clumped particles in 12 (60%). No correlation was found between detection of immune complexes and liver disease whereas the presence of co-existing HB_sAg and HB_sAb or aggregated particles was restrictd to cases of active vasculitis. Seroconversion or he presence of HB$_s$Ab alone was associated with imroved prognosis. It is suggested that circulating epatitis B antigen antibody complexes may be responible for vasculitis or polyarteritis; they do not ppear to be pathogenic for the liver.

395 THE COVERT LIVER DISEASE OF DRUG ADDICTS. *(E.)* Ireton, H. J. C.; Gust, I. D.; Moon, . J.; Lehmann, N.; Stening, G. F.; Smallwood, R. A. Austin Hosp., Heidelberg, Australia). *Aust. NZ J. ed.* 4(5):444-449, 1974.

wenty narcotic addicts (13 male, 7 female, 18-27 r old) who had been using drugs i.v. for at least yr were examined for the presence of liver diease in an attempt to clarify the etiology and sigificance of the liver lesion found in these patients. hree narcotic addicts who had been taking drugs rally for more than 25 yr were also studied. The ollowing investigations were performed: chest x-ray, emoglobin and blood film, WBC, liver function tests, erum protein electrophoresis, immunoelectrophoresis, nti-nuclear factor, anti-smooth muscle and antiitochondrial antibodies. Hepatitis-B antigen and ntibody were evaluated and liver biopsies processed y standard histological techniques. Eleven (55%) of he patients had abnormal liver function tests, but he abnormalities were limited to minor elevations f SGOT (41-98 Karmen U/ml) and alkaline phosphatase 17-32 King Armstrong U/100 ml). BSP retention was ncreased in 7 patients. Abnormal liver biopsies ere seen in 19 (95%) patients, 14 of which showed he changes of chronic persistent hepatitis, and the emaining 5 showed in addition greatly expanded poral tracts with dense lymphoid aggregates and poorly ormed histiocytic granulomas. Foreign material was dentified in 5 biopsies. No patient had hepatitis B ntigen in the serum, but 4 had detectable levels of epatitis-B antibody. No liver abnormality was seen n the 3 patients addicted to oral narcotics. It eems unlikely, therefore, that the lesion results rom a direct hepatotoxic action of narcotics. It s concluded that the liver lesion is associated ith the repeated i.v. injection of contaminated either chemical or infective) drug preparations.

396 ROLE OF SALIVA, URINE AND FECES IN THE TRANSMISSION OF TYPE B HEPATITIS. *(E.)* illarejos, V. M.; Visona, K. A.; Gutierrez, A.; odriguez, A. (Louisiana State Univ. Int. Cent. Med. es. Train., San Jose, Costa Rica). *N. Engl. J. ed.* 291(26):1375-1378, 1974.

he feces, urine and saliva of chronic carriers of epatitis B antigen (HB Ag) and of patients with cute Type B hepatitis were examined by radioimmunossay and counterelectrophoresis to assess their imortance as vehicles of transmission of the infecion. Repeated samples of serum, saliva, urine, and eces from 93 chronic carriers detected in 2 counties f Costa Rica where both Type A and Type B hepatitis ccur endemically, and from 120 household contacts, ere tested for HB Ag. The antigen was present in none of 120 fecal extracts, in three of 130 urine specimens, and was intermittently present in the saliva in 86% of antigenemic carriers. Serum and saliva from 41 acute hepatitis B patients were examined at weekly intervals during the course of the disease. HB Ag was detected in the saliva of 76% of patients with acute hepatitis during the first 3 weeks after clinical onset; 35% of sneeze samples from patients were antigen positive. Antibody, detected by passive hemagglutination, was found in saliva early during clinical disease, as well as during convalescence. Saliva is probably the main vehicle of infection in non-parenterally acquired Type B hepatitis. Transmission may be either airborne, through large droplets expelled by sneezing and coughing, or directly from mouth-to-mouth by kissing or by exchange of chewed objects among children.

1397 EPIDEMIC VIRAL HEPATITIS, TYPE B, IN HOSPITAL PERSONNEL. *(E.)* Williams, S. V.; Huff, J. C.; Feinglass, E. J.; Gregg, M. B.; Hatch, M. H.; Matsen, J. M. (Cent. Dis. Control, Atlanta, Ga.). *Am. J. Med.* 57(6):904-911, 1974.

An investigation of hepatitis in personnel at a university hospital revealed 79 cases of viral hepatitis between January, 1968 and August, 1972 which were apparently not part of a general outbreak in the community. There were approximately 2,700 full-time employees and an additional 500-1000 persons who worked on a part-time basis in the hospital. Two surveys were performed during the investigation. Blood specimens received in each laboratory area over a 24-hr period were examined to compute the percentage of blood in each area that came from patients with renal disease. Personnel who worked on the renal ward and in the clinical laboratories donated blood samples which were examined for hepatitis B surface antigen (HB$_s$Ag) by agar gel diffusion and complement fixation and for antibody to HB$_s$Ag (HB$_s$Ab) by agar gel diffusion and passive hemagglutination. Of those personnel tested for HB$_s$Ag while ill, 71% were positive by agar gel diffusion and 15 of 16 tested for HB$_s$Ab after their recovery were positive. Thirty-four cases of viral hepatitis B occurred in staff who worked on the renal ward and hemodialysis unit, 34 in personnel who worked in the clinical laboratories, and the other 11 primarily in nursing personnel throughout the rest of the hospital. The number of cases correlated temporally with the number of HB$_s$Ag-positive patients undergoing hemodialysis in the hospital. Clinical hepatitis attack rates and HB$_s$Ab prevalence rates correlated with exposure to blood from patients with renal disease, including those who received transplants, both in the renal ward and in the clinical laboratories. Transmission appears to be by accidental and inapparent parenteral routes involving infective blood from patients with renal disease who were chronic carriers of HB$_s$Ag.

1398 ACUTE VIRUS HEPATITIS IN HUMANS. *(Ger.)* Eisenburg, J. (1st Med. Clin., Univ. Munich, Germany). *Naturwissenschaften* 61(7):298-307, 1974.

1399 POST-TRANSFUSION HEPATITIS. *(E.)* Reinicke, V. (Bispebjerg Hosp., Copenhagen, Denmark). *Scand. J. Infect. Dis.* 6(3):285-290, 1974.

1400 CONTRIBUTION OF MICROSCOPY TO THE STUDY OF TYPE B VIRAL HEPATITIS. *(Fr.)* Huang, S. N. (Dep. Pathol., McGill Univ., Montreal, Canada). *Union Med. Can.* 103(12):2140-2145, 1974.

1401 VISUAL DETECTION OF HEPATITIS B ANTIGEN. *(E.)* Giaever, I.; Laffin, R. J. (Gen. Electr. Corp. Res. Develop., Schenectady, N.Y.). *Proc. Natl. Acad. Sci. USA* 71(11):4533-4535, 1974.

1402 AUSTRALIA ANTIGEN. HEPATOCYTES WITH "GROUND-GLASS" TYPE CYTOPLASM. A CASE OF HEPATOMA SUPERIMPOSED ON CIRRHOSIS WITH AUSTRALIA ANTIGEN AND "GROUND-GLASS" HEPATOCYTES. *(Fr.)* Pequinot, H.; Abelanet, R.; Deslignieres, S.; Christoforov, B. (Cochin Hosp., Paris, France). *Ann. Med. Interne (Paris)* 125(6/7):567-569, 1974.

1403 GLUTAMATE DEHYDROGENASE IN HEPATOBILIARY DISEASE. CHANGES IN ACUTE HEPATITIS AND OBSTRUCTIVE JAUNDICE. *(Sp.)* Rodriguez Cuartero, A.; Nunez Carril, J.; Lopez Fernandez, A. (San Cecilio Clin. Hosp., Granada, Spain). *Rev. Esp. Enferm. Apar. Dig.* 44(1):35-44, 1974.

1404 CHANGE IN SALIVARY TRACE ELEMENT CONCENTRATIONS IN VARIOUS STAGES OF VIRAL HEPATITIS. *(Rus.)* Sagradian, A. L. (Tbilisi State Inst. Postgrad. Med., USSR). *Soobshch. Akad. Nauk Gruz. SSR* 76(1):189-191, 1974.

1405 AUSTRALIA-ANTIGEN-POSITIVE TESTS IN HOSPITAL PATIENTS. *(Ger.)* Zollikofer, J.; Frey-Wettstein, M. (Limmattal Blood Donor Cent., Schlieren/Zurich, Switzerland). *Helv. Med. Acta* 37(5/6):401-402, 1974.

1406 THE RESEARCH OF BOTH Au ANTIGEN AND ANTI-Au ANTIBODIES AS A DEDUCTIVE TEST FOR HEPATOCELLULAR CHANGES IN CLINICALLY HEALTHY SUBJECTS. *(It.)* Nobili, G.; Adorisio, E.; Zardi, O. (Aldo di Loreto Inst. Forensic Med., Rome, Italy). *Riv. Med. Aeronaut. Spaz.* 36(3/4):165-175, 1973.

1407 HEPATITIS B VIRUS: EPIDEMIOLOGICAL ASPECTS AND IMMUNOLOGICAL BASIS FOR THE PATHOLOGICAL PHYSIOLOGY. *(Fr.)* Richer, G. (Dep. Microbiol. Immunol., Univ. Montreal, Canada). *Union Med. Can.* 103(12):2116-2122, 1974.

1408 ASPECTS OF HEPATITIS EPIDEMIOLOGY IN SWITZERLAND. *(Ger.)* Gassner, M.; Grob, P. J. (Dep. Intern. Med., Univ. Zurich, Switzerland). *Helv. Med. Acta* 37(5/6):399-400, 1974.

1409 HOSPITAL OUTBREAK OF HEPATITIS. III. RELATION BETWEEN THE CLINICAL AND BIOCHEMICAL CHANGES IN SERUM IMMUNOGLOBULINS. *(Sp.)* Borda Celaya, F.; Perez Miranda, M.; Pons Romero, F.; de Prado Marcilla, J. M.; Errasti Goenaga, P.; Sanchez Ibarrola, A. (Fac. Med., Navarra, Spain). *Rev. Esp. Enferm. Apar.* 44(3):219-230, 1974.

1410 AN EPIDEMIOLOGIC STUDY OF HEPATITIS B VIRUS IN BANGKOK, THAILAND. *(E.)* Grossman, R. A.; Benenson, M. W.; Scott, R. M.; Snitbhan, R.; Top, Jr., F. H.; Pantuwatana, S. (Dep. Epidemiol., SEATO, San Francisco, Calif.). *Am. J. Epidemiol.* 101(2):144-159, 1975.

1411 EXPERIENCE IN TREATMENT OF ACUTE HEPATIC FAILURE. *(E.)* Galmarini, D.; Tarenzi, L.; Cantaluppi, G.; Mantovani, A.; Zanadrea, G.; Pesenti, A.; Girardello, D.; Pellegrini, S.; Doglia, M.; Fabiani, M. P.; Vitali, B. (Cent. Exp. Surg., Univ. Milan, Italy). *Digestion* 10(4/5):349, 1974.

1412 THE EFFECT OF REST ON THE COURSE OF VIRAL HEPATITIS. *(Fr.)* Laverdant, C.; Cristau, P.; Essioux, H.; Molinie, C.; Gendron, Y.; Bernard, J.; Kassem, A. (Begin Mil. Hosp., Saint-Mande, France). *Ann. Med. Interne (Paris)* 125(10):759-766, 1974.

1413 PREVENTION OF VIRAL HEPATITIS BY NONSPECIFIC GAMMA GLOBULINS. *(Fr.)* Baylon, H.; Laverdant, C. (Army Dep. Health, Paris, France). *Bull. Acad. Natl. Med. (Paris)* 158(1):32-38, 1974.

1414 DEMONSTRATION BY THE PROSTIGMINE TEST OF PANCREATIC PARTICIPATION IN ACUTE VIRAL HEPATITIS. *(Rum.)* Negomireanu, T.; Gorgan, V. (Clin. Infect. Dis., Cluj, Rumania). *Cluj Med.* 46(1):43-48, 1973.

See also, 1196, 1318, 1341, 1348, 1350, 1422.

LIVER AND BILIARY TRACT

Chronic Hepatitis

1415 PREVENTION OF CHRONIC NEONATAL HEPATITIS B VIRUS INFECTION WITH ANTIBODY TO THE HEPATITIS B SURFACE ANTIGEN. *(E.)* Kohler, P. F.; Dubois, R. S.; Merrill, D. A.; Bowes, W. A. (Univ. Colorado Med. Cent., Denver). *N. Engl. J. Med.* 291(26):1378-1380, 1974.

Four babies born to mothers positive for the hepatitis B surface antigen (HB_sAg) were treated 1-6 days after delivery with antibody to the antigen and remained antigen negative for 5-14 months. In 6 of 7 similar but untreated babies, chronic antigenemia developed within 5-12 weeks of birth and persisted in all up to the age of 36 months. Two of 7 umbilical-cord serum samples tested by radioimmunoassay were positive (treated babies) but not when tested by electroimmunodiffusion or counterelectrophoresis. Repeat radioimmunoassay testing on blood obtained directly from the babies 1 and 6 days after delivery was negative. Therefore, HB_sAg detected in umbilical-cord blood may not by itself indicate either *in utero* infection or even transplacental transfer of HB_sAg. These results are probably a consequence of contamination of the cord blood at the time of collection with HB_sAg-positive maternal blood or secretions. Treatment with specific antibody appears to be effective, as compared with no treatment, in preventing neonatal hepatitis B virus infection. The current prevalence of the surface antigen in mothers at term is 0.83% at 3 Denver hospitals. It is suggested that HB_sAg testing of women at term and HB_sAb treatment of babies at risk has the potential to reduce in part the reservoir of chronic HB_sAg carriers who lack an appropriate history of exposure to hepatitis B virus or acute liver disease.

1416 CIRCULATING THYROXINE IN CHRONIC ACTIVE LIVER DISEASE. *(E.)* Barzilai, D. C.; Soloway, R. D.; Summerskill, W. H. J.; Schoenfield, L. J. (Mayo Clin., Rochester, Minn.). *Isr. J. Med. Sci.* 10(11):1405-1409, 1974.

Serum levels of free and total thyroxine were recorded before and during treatment of 40 patients with chronic active liver disease (9 males 31 females, aged 13-75 yr), none of whom had thyroid disease. The patients were randomly assigned to 1 of 4 treatments: 1) placebo; 2) maintenance with prednisone, 20 mg/day; 3) azathioprine, 100 mg/day; and 4) a combination of prednisone, 10 mg/day and azathioprine, 50 mg/day. Patients were examined prior to treatment and after 2 weeks, and then every 3-12 months for 3 yr. Before treatment, the most common abnormality (29% of cases) was an increased fraction of thyroxine present as free thyroxine; less often, the fraction was decreased. Occasionally, initial levels of free or total thyroxine were low. Abnormal serum thyroxine levels were always improved in patients who responded to therapy, that is in 13 patients who received prednisone or the combination of prednisone and azathioprine and in 9 who received azathioprine or placebo; abnormal serum thyroxine levels remained unchanged in the 18 patients who did not respond. There was no significant correlation between the concentration of the free fraction of thyroxine and levels of SGOT or serum bilirubin. There was, however, a significant relationship between the serum albumin concentration and the free fraction of thyroxine before and during treatment. The values for serum free thyroxine and total thyroxine were not related to any results of the liver function tests. Deficient binding of thyroxine to protein, predominantly involving the pre-albumin fraction and resulting from dysproteinemia associated with active chronic liver disease, is proposed as a basis for the abnormalities reported. The diagnosis of thyroid disease in patients with active liver disease is made difficult by the unreliability of the serum levels of free and total thyroxine as indicators of thyroid function and should be deferred until the patient has responded to treatment or be confirmed by ancillary studies, including the uptake of radioiodine by the thyroid.

1417 LYMPHOCYTE CYTOTOXICITY TO ISOLATED HEPATOCYTES IN CHRONIC ACTIVE HEPATITIS. *(E.)* Thomson, A. D.; Cochrane, M. A. G.; McFarlane, I. G.; Eddleston, A. L. W. F.; Williams, R. (King's Coll. Hosp. Med. Sch., London, England). *Nature* 252(5485): 721-722, 1974.

Lymphocytes from 22 patients with chronic active hepatitis were incubated with rabbit hepatocytes, the concentration of lymphocytes being adjusted to produce a lymphocyte-to-target-cell (hepatocyte) ratio of 400:1. Tests were also carried out in 6 patients with primary biliary cirrhosis, 4 with primary hepatocellular carcinoma, 5 with inactive alcoholic cirrhosis, 1 with idiopathic hemochromatosis and 1 with obstructive jaundice. Significant cytotoxicity was demonstrated in 20 (90%) of the patients with chronic active hepatitis, and was also present in 2 of 6 patients with primary biliary cirrhosis. In the 11 patients with other forms of chronic liver disease, the results were similar to the controls, none showing significant cytotoxicity. The mean cytotoxicity of 4 patients with chronic active hepatitis, when lymphocytes alone were added to the incubation chambers, was 53.6%. The addition of either human or rabbit liver-specific lipoprotein prepared from normal rabbit tissue and human organs, together with the lymphocytes, produced a highly significant reduction in cytotoxicity, 5.3% and 5.5%, resp. These blocking experiments implicate sensitization to human liver-specific lipoprotein in chronic active hepatitis as the important factor in the production of the lymphocyte-mediated hepatocyte injury. Such sensitization might be initiated by structural changes in the membrane lipoprotein following virus or drug-induced liver damage, but the specific mechanism has not been determined.

1418 LEUCOCYTE MIGRATION INHIBITION IN LIVER DISEASE. *(E.)* Vergani, C.; Oldoni, T.; Dioguardi, N. (Inst. Clin. Pathol., Univ. Milan, Italy). *J. Clin. Pathol.* 27(10):772-775, 1974.

The usefulness of the migration inhibitory factor (MIF) test as a diagnostic tool in liver disease was investigated in 88 patients with liver disease and in 24 healthy controls. The patients were divided into those with acute hepatitis (13), chronic persistent hepatitis (11), chronic aggressive hepatitis (24), cryptogenic cirrhosis (23), alcoholic cirrhosis (11), and primary biliary cirrhosis (6). Leukocytes were obtained from peripheral venous blood and placed in capillary tubes in a Teflon ring chamber. About 1 ml of tissue culture medium, with or without antigen, was added to the chamber and the leukocytes allowed to migrate for 20 hr after which the migration index was determined. Fetal liver antigen obtained at necropsy was added to the chamber to give 400 μg protein/ml tissue culture medium. Tests were found to be reproducible with respect to the coefficient of variation and also when they were repeated 3 times on the same patient within 1 week. Migration index in healthy controls varied from 87 to 113%. Significant abnormality in migration index was found only in chronic aggressive hepatitis (inhibition in 16 patients, 67%), in cryptogenic cirrhosis (inhibition in 10, 43%; stimulation in 3, 13%), and in primary biliary cirrhosis (inhibition in 2, stimulation in 2). No correlation was detected between MIF and serum γ-globulin, SGOT, SGPT, total bilirubin, or the presence of hepatitis B antigen. These data provide evidence that cell-mediated immunity is implicated in some forms of chronic liver disease, and indicate that the MIF test is a diagnostically useful tool for some forms of liver disease, especially when liver biopsy is not feasible because of coagulation disorders.

1419 INADEQUATE ANTIBODY RESPONSE TO HBAg OR SUPPRESSOR T-CELL DEFECT IN DEVELOPMENT OF ACTIVE CHRONIC HEPATITIS. *(E.)* Eddleston, A. L. W. F.; Williams, R. (King's Coll. Hosp. Med. Sch., London, England). *Lancet* 2(7896):1543-1545, 1974.

The role of autoimmunity in the pathogenesis of active chronic hepatitis is reviewed. It is theorized that the progressive liver damage of active chronic hepatitis is due to an autoimmune reaction directed against an hepatocyte surface lipoprotein which is initiated in most cases by a hepatitis-B-virus infection. According to this theory, T cells recognizing viral determinants activate B cells responsive to the lipoprotein antigen, and where virus infection persists because of a defect in the antibody response to HB Ag, the autoimmune response is continuously activated. In contrast, in the HB Ag-negative group the virus is eliminated normally and the autoimmune reaction persists because of a defect in the suppressor effect of T cells on B cell activity. A genetic marker of this defect may be the histocompatibility antigen HL-A8 which is found in an increased frequency only in the HB Ag-negative cases. Correcting the basic defects by specific immunotherapy is a possibility for the future.

1420 HUMORAL IMMUNITY IN RELATIVES OF PATIENTS WITH ACTIVE CHRONIC HEPATITIS. *(E.)* Joske, R. A.; Sanderson, C. R. (Dep. Med., Univ. West. Australia, Perth). *Aust. NZ J. Med.* 4(5): 441-443, 1974.

Humoral immunity was investigated in 39 first-degree and 12 second-degree relatives of 14 patients (12 females and 2 males) with active chronic hepatitis. Five spouses were also examined to determine possible environmental factors. Blood was taken from each subject for the following tests: hemoglobin, WBC, erythrocyte sedimentation rate, serum bilirubin, alkaline phosphatase, SGOT, SGPT, serum proteins, quantitative protein electrophoresis, immunoglobulins (A, G, and M), hepatitis B antigen, hepatitis B antibody, thyroglobulin antibody, cryoglobulins, Wassermann reaction, cold agglutinins, and rheumatoid factor. Antinuclear factors, antismooth muscle antibody, antimitochondrial antibody and antiparietal cell antibody were also investigated. None of the relatives had clinical evidence of chronic liver or immunopathic disease. A significant increase was shown in the number of abnormal immunological findings, especially hyperglobulinemia (3 males and 1 female) and the presence of tissue antibodies (13 of 37 tested). There were fewer abnormalities in the 12 second-degree relatives. The 5 spouses were normal to all tests used. These results provide evidence that abnormalities of humoral immunity occur with increased frequency in relatives of patients with active chronic hepatitis compared with control populations. These abnormalities are considered to have a genetic basis because 1) they were present in relatives living apart from the patients but absent in marriage partners; and 2) they were more frequent in first than in second degree relatives. The nature of this genetic factor is not known.

1421 SCINTIGRAPHIC STUDIES IN CHRONIC HEPATITIS. *(E.)* Bozduganov, A.; Maistorski, A.; Janev P. (I. P. Pavlov Higher Med. Inst., Plovdiv, Bulgaria *Folia Med. (Plovdiv)* 16(1):27-33, 1974.

1422 CHANGES IN URINARY γ-GLUTAMYLTRANSPEPTIDASE LEUCINE AMINOPEPTIDASE, LACTATE DEHYDROGENASE, AND α-HYDROXYBUTYRATE DEHYDROGENASE IN HEPATOBILIARY DISEASE. *(Sp.)* Rodriguez Cuartero, A.; Nunez Carril, J. (San Cecilio Clin. Hosp., Granada, Spain). *Rev. Esp. Enferm. Apar. Dig.* 44(4):365-374, 1974.

1423 EFFECT OF A SINGLE DOSE OF FUROSEMIDE IN PATIENTS SUFFERING FROM CHRONIC HEPATIC DISORDERS. *(Sl.)* Dzurikova, V.; Brixova, E.; Niederland, T. R. (Res. Inst. Hum. Nutr., Conemius Univ., Bratislava, Czechoslovakia). *Bratisl. Lek. Listy* 61(3):336-343, 1974.

1424 HISTORIES OF PATIENTS WITH CHRONIC LIVER DISEASES IN A HEPATOLOGICAL SANATORIUM. *(Ger.)* Jorke, D.; Taeschner, H.; Wagner, M.; Reinhardt, M. (Jena Munic. Hosp., Germany). *Gesamte Inn. Med.* 29(14):580-587, 1974.

1425 CHRONIC HEPATITIS IN ADULTS AND CIRRHOSIS. *(It.)* Ventura, E. (Inst. Clin. Gen. Med. Med. Ther., Univ. Modena, Italy). *Med. Soc.* 23(2): 69-70, 1973.

1426 ONE CASE OF A SOLID MALIGNANT MESENTERIC TUMOR, CHRONIC HEPATITIS, AND CHYLOUS ASCITES DIAGNOSED BY LAPAROSCOPY. *(Sp.)* Herrerias Gutierrez, J. M.; Damiano Rivero, A.; Jimenez Peperez, J.; Sanchez Venegas, S.; Chamorro Lopez, J.; Garrido Peralta, M. (Fac. Med., Univ. Seville, Cadiz, Spain). *Rev. Esp. Enferm. Apar. Dig.* 44(3):257-266, 1974.

1427 PROBLEMS OF CHRONIC VIRAL HEPATITIS IN ADULTS AND THEIR SOCIAL IMPLICATIONS. *(It.)* Manenti, F. (Inst. Clin. Gen. Med. Med. Ther., Univ. Modena, Italy). *Med. Soc.* 23(2):65-69, 1973.

See also, 0888, 0915, 1196, 1318, 1380.

LIVER AND BILIARY TRACT

Alcoholic Liver Disease

1428 HIGH BLOOD ACETALDEHYDE LEVELS AFTER ETHANOL ADMINISTRATION: DIFFERENCE BETWEEN ALCOHOLIC AND NONALCOHOLIC SUBJECTS. *(E.)* Korsten, M. A.; Matsuzaki, S.; Feinman, L.; Lieber, C. S. (Bronx VA Hosp., N.Y.). *N. Engl. J. Med.* 292(8):386-389, 1975.

The blood acetaldehyde levels after experimental alcohol administration were investigated using 6 men with chronic alcoholism and 5 male control patients (aged 35-46 yr). In both alcoholic and control patients, blood acetaldehyde levels varied in a characteristic fashion in relation to ethanol. Acetaldehyde concentrations remained steady over a wide range of falling ethanol levels (from 54 to 33 mM), but abruptly dropped when the ethanol levels reached concentrations of 17.4 to 32.6 mM (mean 24 mM). Before this falloff, the acetaldehyde plateau of the alcoholic subjects fluctuated about a mean of 42.7 μM, significantly higher than that of the nonalcoholic, 26.5 μM. Peak ethanol levels and ethanol disappearance rates for the 2 groups were not significantly different. Losses of ethanol by respiratory and renal routes averaged 5% of the total amount infused (100 to 120 g). Percutaneous needle liver biopsies were performed on 2 alcoholic subjects. One biopsy revealed mild to moderate steatosis. The other demonstrated persistent lesions of alcoholic hepatitis, including alcoholic hyaline, fat and moderate inflammatory infiltrate. The results of this study show a dose-response relation between blood acetaldehyde and ethanol levels after ethanol administration. The ethanol concentration at which the fall of blood acetaldehyde occurred suggests desaturation of an ethanol oxidizing system other than alcohol dehydrogenase and indicates that at high ethanol blood levels, such a system contributes to ethanol oxidation. The higher acetaldehyde levels in alcoholism may result from both greater activity of this system and mitochondrial damage, and could contribute to the neurologic, hepatic and cardiac complications of alcoholism.

See also, 0905, 0909, 1042.

LIVER AND BILIARY TRACT

Cirrhosis

1429 HEPATOCYTE ULTRASTRUCTURAL CHANGES IN α_1-ANTITRYPSIN DEFICIENCY. *(E.)* Feldmann, G.; Bignon, J.; Chahinian, P.; Degott, C.; Benhamou, J. P. (INSERM, Beaujon Hosp., Clichy, France). *Gastroenterology* 67(6):1214-1224, 1974.

Liver cell ultrastructure was studied in 6 adult patients (3 male 3 female, 27-56 yr old) with α_1-antitrypsin deficiency; all except 1 were suffering from severe pulmonary emphysema. The liver was histologically normal in 3 patients, and portal fibrosis or cirrhosis was present in the other 3. Serum bilirubin, SGPT, BSP elimination, alkaline phosphatase, serum albumin, and γ-globulins were normal in 5 patients, except for SGPT in 1 patient which was 40 IU. In the sixth patient, serum albumin was 3.0 g/100 ml, alkaline phosphatase was 6.0 Bessey-Lowry-Brock U, and BSP retention at 45 min was 75%. Conventional electron microscopy showed specific changes consisting of deposits of an amorphous material in the dilated lumina of the endoplasmic reticulum; although these changes were demonstrated in all specimens, the number of liver cells showing these abnormalities varied markedly with each patient. The other liver cells were normal or were affected by nonspecific changes consisting mainly of an increased number of lysosomes. The liver cells with these nonspecific changes were seen only in the patients with liver fibrosis or cirrhosis. Electron microscopy, combined with the use of anti-α_1-antitrypsin antibodies labeled with horseradish peroxidase, demonstrated that a material antigenically similar to α_1-antitrypsin was present in the deposits and on the ribosomes of the endoplasmic reticulum of those liver cells with the specific ultrastructural changes. It is suggested that this material is manufactured by these ribosomes, and that it accumulates in the endoplasmic reticulum lumina because of an abolished or reduced secretion. The fact that cirrhosis or fibrosis is absent in patients whose liver cells nevertheless contain deposits of this amorphous material supports the view that the ultrastructural hepatocytic lesions associated with, or leading to, fibrosis or cirrhosis are not directly related to accumulation of this material.

1430 ULTRASTRUCTURAL CHANGES OF JEJUNAL EPITHELIAL CELLS IN LIVER CIRRHOSIS. *(E.)*

Portela-Gomes, G.; Martins, M. M.; Correia, J. P. (Univ. Hosp. St. Maria, Lisbon, Portugal). *Scand. J. Gastroenterol.* 9(7):657-663, 1974.

The stereomicroscopic and histological appearances of the jejunal mucosa and the ultrastructure of the villous absorbing-cells were studied in 10 patients with liver cirrhosis (9 chronic alcoholics and 1 non-alcoholic, 29-63 yr old) and in 5 normal subjects. Biopsies were performed with the Crosby-Kugler capsule under fluoroscopy. The controls had a normal structure and showed features similar to those previously published. In the 10 patients with cirrhosis normal finger and leaf-shaped villi were observed on the stereomicroscope. Histological examination of these biopsies showed a normal mucosa. In all cases, the ultrastructure of the epithelial cells showed an irregular pattern of abnormalities of varied severity. The abnormal cells showed irregularity and blistering of the microvilli, and the terminal web area was poorly developed, with an increased number of vacuoles. The mitochondria were swollen with clear spaces and myelin-like material. There were abundant vesicles containing lipid-like substance; the smooth endoplasmic reticulum was increased, and the rough endoplasmic reticulum persisted only in close association with mitochondria. There were enlarged vesicles of the Golgi complex. The nuclei were irregularly shaped, and in the cytoplasm there were autophagic vacuoles and myelin figures. The patient with cirrhosis and no alcoholism showed some alterations of the microvilli, autophagic vacuoles, and irregularly shaped nuclei. There was no clinical evidence of malabsorption in the patients, and the fecal fat excretion was normal in the 7 cases studied. No correlation of morphologic abnormalities with clinical findings was evident. The presence of numerous vesicles containing lipid-like substances suggests a delay in lipid transport through the cells. Ethanol-induced changes in the small intestine similar to those found in the 9 alcoholic patients with cirrhosis have been described in the literature. It is suggested that the observed abnormalities may be related to the toxic action of ethanol, because 7 of 9 alcoholic patients were in hospital for less than 30 days.

1431 α_1-ANTITRYPSIN DEFICIENCY, EMPHYSEMA, CIRRHOSIS, AND INTESTINAL MUCOSAL ATROPHY. *(E.)*

Greenwald, A. J.; Johnson, D. S.; Oskvig, R. M.; Aschenbrener, C. A.; Randa, D. C. (Univ. Iowa Hosp., Iowa City). *JAMA* 231(3):273-276, 1974.

A case history is presented for a 64-yr-old man who had severe α_1-antitrypsin deficiency, pulmonary emphysema, hepatic cirrhosis, and a malabsorption syndrome indistinguishable from adult celiac disease. Laboratory investigations gave the following results: heamtocrit reading, 36%; leukocytes, 2,600/mm^3; serum iron concentration, 42 μg/100 ml; total iron-binding capacity, 270 μg/100 ml; serum carotene concentration 7 μg/100 ml; serum α_1-antitrypsin concentration, 50 mg/100 ml (normal, 180-244) as measured by radial immunodiffusion; total serum protein level, 7.5 g/100 ml; albumin level, 2.4 g/100 ml; alkaline phosphatase level, 101 mU/ml; SGOT concentration, 90 mU/ml; and total bilirubin, 0.9 mg/100 ml. The jejunal mucosal folds were thickened and the intestinal lumen was slightly dilated. A biopsy specimen of the jejunum demonstrated marked chronic inflammation in the lamina propria and villous atrophy, with disarray of the epithelial cells. In spite of a series of surgical procedures to correct gastrointestinal hemorrhaging, the patient continued to hemorrhage and died. Postmortem findings showed severe emphysema, portal cirrhosis, and a moderate amount of lymphocytic infiltrate in the liver. Numerous, round, periodic acid-Schiff (PAS)-positive, diastase-resistant intracytoplasmic inclusion bodies were seen within lobules varying in location from periportal to centrilobular with no clear predominance of either location. It is suggested that a celiac-like disease did not occur by chance in this case and that this condition may represent another variation among a group of diseases associated with low serum levels of α_1-antitrypsin. The physiologic function of α_1-antitrypsin in the human body is unknown, however, and the basis for an association between a celiac-like disease and α_1-antitrypsin deficiency has not been elucidated.

1432 PURIFICATION AND PARTIAL CHARACTERIZATION OF PAS-POSITIVE INCLUSION BODIES FROM THE LIVER IN ALPHA$_1$-ANTITRYPSIN DEFICIENCY. *(E.)*

Eriksson, S.; Larsson, C. (Gen. Hosp., Malmo, Sweden). *N. Engl. J. Med.* 292(4):176-180, 1974.

The periodic acid-Schiff (PAS)-positive inclusion bodies were isolated from cirrhotic livers of patients who also had a primary hepatoma and homozygous α_1-antitrypsin deficiency and their main component, hepatic antitrypsin, partially characterized. Portions of livers weighing 30 g were cut into thin slices which were incubated for 1 hr at 37 C with 50 ml Hanks buffer containing 25 mg collagenase and 0.02% sodium azide. The filtrate was centrifuged and the resulting pellet taken up in 12 ml 0.25 M sucrose containing 0.02% sodium azide. The suspension was sonicated for 30 sec before undergoing gradient centrifugation. The final pellet consisted of practically pure PAS-positive globules of uniform size with an average diameter of 2-3 μm, approximately the same molecular size as serum α_1-antitrypsin. Immunologic similarity between the isolated protein and serum α_1-antitrypsin was established by the isolate's ability to react with

rescein-isothiocyanate-conjugated antibodies
nst serum α_1-antitrypsin and to raise antibodies
nst it in rabbits, and with the double immuno-
usion technique. On agarose gel electrophoresis
tic antitrypsin migrated as an α_2-globulin before
after neuraminidase treatment. Chemical analysis
ed a complete absence of sialic acid. Hepatic
trypsin had a pronounced tendency to form insol-
macroaggregates. The author concludes that the
lable data support the concept that the accumula-
of antitrypsin in the endoplasmic reticulum is
ciated with an insufficient sialylation of the
ein.

A STUDY OF CARBOHYDRATE METABOLISM IN POSTNECROTIC CIRRHOSIS OF LIVER. *(E.)*

g, R. T. T.; Wang, C. C. L. (Queen Mary Hosp.,
; Kong). *Gut* 15(11):907-912, 1974.

relationship between carbohydrate metabolism and
lin secretion was studied in 21 patients (all
, 23-58 yr) with postnecrotic cirrhosis of un-
rmined origin and the disorders of carbohydrate
bolism were correlated with liver function. I.v.
ose tolerance, insulin tolerance, tolbutamide,
glucagon tests were performed. Based arbitrar-
on the BSP retention test the patients were di-
d into group A, 9 patients with less impaired
r function, and group B, 12 patients with great-
mpairment of liver function. I.v. glucose and
lin tolerances were reduced in both groups. The
glycemic effect of tolbutamide was similar in
controls (10 healthy male subjects) and in both
ps of cirrhotic patients, but this was achieved
igher plasma insulin levels in group B indica-
; resistance of the liver to the effect of endo-
us insulin. The blood glucose response to glu-
n was markedly impaired in group B patients
h is consistent with this hypothesis. The insu-
response to glucagon was reduced in the cirrho-
patients. Fasting human growth hormone and free
y acid levels were elevated in both groups, but
istical analysis showed no significant correla-
between plasma growth hormone or free fattv acid
ls and the production of insulin resistance. It
oncluded that impaired glycogenesis accounts for
lin resistance in a proportion of cases only and
other factors have yet to be identified.

ASSESSMENT OF AMINOPYRINE METABOLISM IN MAN BY BREATH ANALYSIS AFTER ORAL ADMINISTRATION ^{4}C-AMINOPYRINE: EFFECTS OF PHENOBARBITAL, DISUL- AM AND PORTAL CIRRHOSIS. *(E.)*

Hepner, G. W.;
ll, E. S. (Pennsylvania State Univ. Coll. Med.,
hey). *N. Engl. J. Med.* 291(26):1384-1388, 1974.

een healthy ambulant control subjects (11 male, 4
le, 21-80 yr), 10 healthy nonambulant controls (5
, 5 female, 23-66 yr), and 10 patients with portal
hosis (7 male, 3 female) were given 2 µCi ^{14}C-amino-
ine p.o. together with 9 mg/kg unlabeled aminopyrine.
d samples of 10 ml were taken 3, 6, 9, and 12 hr
r aminopyrine administration. Breath samples were
lected hourly, 1-8 hr and 12 hr after drug administration. Some of the volunteers were restudied 2 weeks after the 1st study, after 7 days pretreatment with phenobarbital (2 mg/kg/day), or after 4 days pretreatment with disulfiram (250 mg/day). Aminopyrine in serum samples was analyzed spectrophotometrically; breath samples were counted in a liquid scintillation counter. Aminopyrine metabolic clearance rate and 12-hr breath $^{14}CO_2$ output in the healthy volunteers studied before and after drug pretreatment correlated highly ($r = 0.91$). The metabolic clearance rate was 46 ml/min in the patients with portal cirrhosis, and 122 ml/min in the healthy controls. $^{14}CO_2$ breath output at 12 hr was 13.8% in the patients with portal cirrhosis, and 32.6% in the nonambulant controls. It is suggested that *in vivo* breath analysis after administration of ^{14}C-aminopyrine provides useful information about hepatic drug metabolism in health and disease.

1435 IRON STORAGE DISORDERS OF THE LIVER. *(E.)*

Grace, N. D.; Powell, L. W. (Tufts Univ. Sch. Med., Boston, Mass.). *Gastroenterology* 67(6): 1257-1283, 1974.

An extensive review of the literature on hepatic disorders associated with increased iron deposition is presented. Hemochromatosis is defined as a pathological entity with the following characteristics: cirrhosis or fibrosis of the liver with increased iron stores, primarily in the parenchymal cells of the liver but also in other organs, including pancreas, heart, pituitary, and adrenals. It includes all of the following: idiopathic hemochromatosis, cirrhosis of the liver with secondary iron overload, liver disease associated with certain anemias, with dietary iron overload, or with transfusional, and congenital transferrin deficiency. The following aspects of iron metabolism are discussed in relation to the development of hepatic iron overload: absorption, body content and distribution, transport, storage, and mobilization. Acute and chronic iron toxicity are considered as are the pathology and diagnosis of hemochromatosis. Each of the disease entities included under the definition of hemochromatosis is treated in some detail, including their prognosis and management. A number of conclusions were reached as a result of this review: 1) hemochromatosis is not a single disease but rather should be viewed as several disorders leading to a similar pathological entity. There is an apparent difference in the geographical distribution of these disorders; 2) clinical evidence suggests that iron is at least a contributing factor in the development of hepatic injury; 3) if phlebotomy treatment of idiopathic hemochromatosis is employed, the patient should be maintained in an iron-depleted state by repeated phlebotomy; 4) phlebotomy does not appear to have a role in the treatment of the alcoholic cirrhotic with excess iron stores; 5) patients with idiopathic hemochromatosis can be differentiated from the alcoholic cirrhotic with increased hepatic iron stores by a strong family history of iron storage disease, lack of a history of increased alcohol intake, and significant cardiac or endocrine involvement, especially of the pituitary. Three hundred references are cited.

1436 FIBRINOGEN IN LIVER DISEASE. *(E.)* Wardle, E. N. (R. Victoria Infirm., Newcastle upon Tyne, England). *Arch. Surg.* 109(6):741-746, 1974.

Plasma fibrinogen catabolism was studied by a ^{125}I-fibrinogen assay in 42 patients with liver disease (liver cirrhosis, trauma, acetaminophen toxicity, biliary obstruction, metastatic liver disease, cholangitis or cholestatic hepatitis) and in 24 controls. All patients received p.o. sodium iodide to block the thyroid, and plasma and urinary fibrinogen levels were determined at various times following injection of ^{125}I-fibrinogen. The fibrinogen half-life in controls was 95.3 hr with a fractional catabolic rate (percent of the intravascular pool catabolized per day) of 21.8%. The highest fibrinogen catabolism rates were found in patients with cholangitis (half life = 42.5-65 hr) and liver contusion (36-52 hr). Increased fibrinogen catabolism also occurred with portal cirrhosis (half life = 53.6 hr; fractional catabolic rate = 39.6%) and in obstruction (51.0-67.2 hr; 34.2-43.5 hr). Portal cirrhosis patients had increased fibrinolysis while obstructed patients showed decreased fibrinolysis. The increased fibrinogen catabolism could be accounted for by liver cell necrosis and, more commonly, by endotoxemia or overt infection. Endotoxin assays showed a correlation between increased endotoxin levels and the presence of intravascular coagulation suggesting that endotoxemia plays an important role in the intravascular coagulation associated with liver disease.

1437 ISOPROTERENOL IN OFFSETTING ADVERSE EFFECTS OF VASOPRESSIN IN CIRRHOTIC PATIENTS. *(E.)* Sirinek, K. R.; Thomford, N. R. (Ohio State Univ. Coll. Med., Columbus). *Am. J. Surg.* 129(2):130-136, 1975.

The combined administration of isoproterenol and vasopressin was investigated in 10 patients with Laennec's cirrhosis and portal hypertension. The portal vein, superior vena cava and one radial artery were catheterized for continuous monitoring of pressures and cardiac output. Forty-eight to 72 hr after catheterization, each patient was put through a daily study for 3 days consisting of a 60 min stabilization period, a 60 min test period, and a 60 min observation period. During the test period, a 4 U/ml 5% dextrose solution of lysine-vasopressin was infused into a vein in the arm at 100 ml/hr for 1 hr. Those who had a significant drop in cardiac output were studied for a second 3 day period using in addition to the previous dosage of vasopressin, a 0.002 mg/ml 5% dextrose solution of isoproterenol. During the first 3 day period, the portal pressures decreased on the average from 354 to 248 mm saline after 60 min. Five of the 10 patients had also had a significant reduction of cardiac output from 6.6 to 4.7 liter/min within 5 min of infusion. When these patients were given both drugs, cardiac output remained close to control value. Reduction in portal pressure in this group was from 371 to 271 mm saline after 60 min. It is concluded that isoproterenol may reduce the hemodynamic hazards associated with administration of vasopressin.

1438 SPLENOAZYGOS SHUNT FOR STENOSIS OF THE SUPRAHEPATIC INFERIOR VENA CAVA WITH CIRRHOSIS: SECONDARY BUDD-CHIARI SYNDROME. *(E.)* Saubier, E. C.; Brault, A.; Partensky, C. (no affil.) *Int. Surg.* 59(10):526-532, 1974.

A 30 yr old North African male was hospitalized for ascites and vomiting. There was a previous hospitalization for ascites from extrahepatic disease. Examination disclosed stenosis of the inferior vena cava with collateral circulation but no compensation of portal hypertension. There were esophageal varices from the cardia to the aortic arch, enlargement of the spleen, cirrhosis and secondary Budd-Chiari syndrome, indicated by obstruction of the supra-hepatic veins. Surgery was performed to direct the portal flow into the superior vena cava by construction of a splenoazygous anastomosis. A 5 month follow-up showed the collateral circulation had disappeared and the esophageal varices had decreased

1439 SIDE-TO-SIDE PORTACAVAL SHUNT IN THE TREATMENT OF BUDD-CHIARI SYNDROME. *(E.)* Prandi, D.; Rueff, B.; Benhamou, J. P. (INSERM, Beaujon Hosp., Clichy, France). *Gastroenterology* 68(1):137-141, 1975.

A 22 yr old woman was hospitalized for ascites, and a diagnosis of Budd-Chiari syndrome of unknown etiology was made. Because attempts at control by low sodium diet, furosemide, and spironolactone were unsuccessful, surgery was indicated. Ascitic fluid was removed during laparotomy. The right lobe of the liver was atrophic while the left was enlarged and purplish, and the Spigel lobe was slightly enlarged. A side-to-side portacaval shunt was constructed. The patient's condition improved rapidly after surgery and liver size slightly decreased. Her condition was still excellent 19 months later. It is suggested that side-to-side portacaval shunt be considered in patients with recurrent or intractable ascites.

1440 PORTACAVAL ANASTOMOSIS AND PEPTIC ULCER: A NONASSOCIATION. *(E.)* Phillips, M. M.; Ramsby, G. M.; Conn, H. O. (VA Hosp., West Haven, Conn.). *Gastroenterology* 68(1):121-131, 1975.

Cirrhotic patients with portacaval anastomoses were compared with unshunted cirrhotic patients to determine whether the operation results in greater frequency of peptic ulcer. One hundred eight subjects were divided into 2 randomized groups of which 48 had prophylactic portacaval anastomoses and 60 were unoperated controls. To establish the clinical relevance of the randomized groups, 2 nonrandomized groups were included, of which 77 were excluded from the randomized study and 44 had been given therapeutic portacaval anastomoses. Peptic ulcer diagnosis was based on demonstration of the crater by x-ray, endoscopy or surgery. There were 2 statistically significant findings. (1) Eleven of the 60 controls, and 11 of the 48 with prophylactic anastomoses had had peptic ulcers at some time. (2) In the combined unoperated groups, there was an average of 19 months between inclusion in the study and diagnosis of ulcer, while in the combined operated groups it was 48 months. In a 2 yr inclusion period 76% of the post-inclusion ulcers occurred in the unoperated groups while in the combined operated groups only 38% occurred, suggesting that the operation delays clinical appearance of peptic ulcer. It is concluded that the prevalence of peptic ulcer in cirrhotic patients increases progressively with time, regardless of surgery.

1441 THORACIC DUCT AND HEPATIC LYMPH IN IDIOPATHIC PORTAL HYPERTENSION. *(E.)* Samanta, A. K. S.; Saini, V. K.; Chhuttani, P. N.; Patra, B. S.; Vashista, S.; Datta, D. V. (Postgrad. Inst. Med. Educ. Res., Chandigarh, India). *Gut* 15(11): 903-906, 1974.

Lymph dynamics were studied in 2 phases in idiopathic portal hypertension: 1) the thoracic duct lymph was studied in 11 patients by cannulating the duct to determine if there is any alteration in lymph transport; and 2) the hepatic lymphatics were studied by percutaneous hepatography in 16 patients. In addition, the hepatic lymph was studied in 13 other cases of cirrhosis of the liver and in 5 control subjects. Patients with idiopathic portal hypertension and cirrhosis had bleeding from varices in the recent past. Parameters studied were thoracic duct size and pressure, lymph flow rate, hematocrit, and protein. The thoracic duct was appreciably greater in diameter, distended, and turgid with lymph in patients with idiopathic portal hypertension. The lymph flow rate (2.70 ml/min) was consistently higher than the normal of 1 ml/min. Patients with cirrhosis of the liver had a mean lymph flow rate of 3.44 ml/min. Analysis of the lymph flow rate revealed no statistically significant correlation with the serum albumin and the 45-min plasma BSP retention. There was a positive, but not statistically significant, correlation with such hemodynamic parameters as free hepatic venous pressure, wedge hepatic venous pressure, estimated hepatic blood flow, and hepatic vascular resistance. The mean lymph:serum protein ratio was markedly lower in idiopathic portal hypertension (0.29) than in cirrhosis (0.41). Lymph was grossly hemorrhagic in all patients with idiopathic portal hypertension and the lymph hematocrit was 1.45%. Hepatic lymphatics were demonstrated in 3 of 16 patients studied by percutaneous hepatography. The lymphatics appear as tortuous and beaded interlacing channels traversing the liver towards its hilum and finally draining to the paraaortic region. No single hemodynamic parameter could be solely incriminated in the pathogenesis of increased liver lymph formation. The finding of hemorrhagic lymph suggests the hepatic sinusoidal bed as one of the sources of increased thoracic duct lymph. The fact that the lymph:serum protein ratio was distinctly lower in idiopathic portal hypertension than in cirrhosis may indicate that the contribution of intestinal lymph to the thoracic duct in idiopathic portal hypertension is a more important factor than in cirrhosis.

1442 COEXISTENT INFERIOR VENA CAVAL AND PORTAL HYPERTENSION. SPLENIC TO LEFT HEPATIC VEIN ANASTOMOSIS IN A CIRRHOTIC PATIENT. *(E.)* Maillard, J. N.; Hay, J. M.; Elman, A.; Sicard, J. L. (Louis Mourier-UER Xavier-Bichat Hosp., Colombes, France). *Arch. Surg.* 109(6):819-821, 1974.

A portal-systemic shunt designed to decompress the splanchnic venous circulation when the inferior vena cava is not available was used in a patient with a preoperative diagnosis of combined portal and caval hypertension. The patient, a 44 yr old man with cirrhosis presumably due to alcoholism, had undergone an end-to-side portacaval shunt 1 yr earlier. In the present surgery, the patient underwent splenectomy, left lateral hepatic lobectomy, and end-to-end anastomosis of the splenic vein to the left hepatic vein which was dissected free to its juncture with the inferior vena cava at the diaphragm. An end-to-end anastomosis 20 mm in diameter was then possible with a flow through this shunt of 900 ml/min. The portal pressure, however, was reduced only from 40 to 30 mm Hg. The persistent high portal pressure was attributed to over transfusion. The postoperative course was complicated but by the 50th postoperative day, the patient was well enough to be restudied. An arteriogram showed that blood flowed predominantly from the superior mesenteric vein retrograde through the splenic vein and the splenohepatic shunt; enough contrast material went through the portacaval shunt to visualize the narrow retrohepatic segment of the inferior vena cava and the small hepatic portion of the portal vein. Subsequently, the patient continued to recover slowly, but 4 months postoperatively died from liver failure secondary to pulmonary sepsis. The authors claim that the operation has several advantages over those previously described: 1) it does not require a combined thoracic and abdominal approach; 2) it involves only a single vascular anastomosis and does not require a prosthetic conduit; and 3) the shunt fits the pathologic anatomy nicely, and is capable of handling a large flow volume. It is indicated when portal hypertension must be corrected in the face of extrinsic retrohepatic caval compression or thrombosis.

1443 NODULAR, NON-CIRRHOTIC LIVER ASSOCIATED WITH PORTAL HYPERTENSION IN A PATIENT WITH RHEUMATOID ARTHRITIS. *(E.)* Harris, M.; Rash, R. M.; Dymock, I. W. (Dep. Pathol., Univ. of Manchester, England). *J. Clin. Pathol.* 27(12):963-966, 1974.

A case is presented of liver nodularity associated with rheumatoid arthritis but not with Felty's syndrome. A 79 yr old woman presented with massive ascites, ankle and sacral edema, and gangrene of 2 fingertips. There was inactive rheumatoid arthritis. The ascites was tapped, but attempts to keep it under control with diuretics failed, and the patient died of liver failure shortly thereafter. Diagnosis was hepatic cirrhosis with portal hypertension and bleeding from esophageal varices. Necropsy revealed an unusually small liver (592 g) with an ill-defined nodularity on the surface and evidence of portal hypertension. Light microscopy showed the nodularity to be due to changes in the texture and arrangement of the liver cell plates. This resembled 5 previous cases in which nodularity without fibrosis was associated with portal hypertension; however, this was the first case in which Felty's syndrome was not present. It is suggested that the condition may be associated with the rheumatoid process *per se* rather than Felty's syndrome.

1444 HEPATIC INJURY FROM CHRONIC HYPERVITAMINOSIS A RESULTING IN PORTAL HYPERTENSION AND ASCITES.

(E.) Russell, R. M.; Boyer, J. L.; Bagheri, S. A.; Hruban, Z. (Dep. Med., Univ. Chicago, Ill.). *N. Engl. J. Med.* 291(9):435-440, 1974.

Case histories are presented of 2 patients with chronic vitamin A intoxication caused by massive doses of the vitamin taken for 5-8 yr because of health fetishes. The patients were initially seen because of ascites and clinical signs of cirrhosis. Histologic examination of liver biopsy material revealed perisinusoidal fibrosis, central-vein sclerosis and focal congestion associated with perisinusoidal lipid storage cells. Vitamin A fluorescence was found on frozen sections, and direct assay of tissue revealed substantial increases in vitamin A content (1700 to 2200 μg/g wet liver). Electron microscopy demonstrated an increase in basement-membrane-like material and collagen within the perisinusoidal space in association with lipid-filled Ito cells. The nature of this unusual lesion suggested that it might obstruct hepatic blood flow, result in considerable parenchymal-cell atrophy and lead to portal hypertension. It is further suggested that chronic ingestion of large amounts of vitamin A stimulates fibrogenesis and results in a disorder of hepatic function resembling cirrhosis. Ascites has remained a continuing problem with one of the patients, even though vitamin A was stopped. It is possible that the stimulus to fibrosis may continue since mobilization of the large hepatic stores of vitamin A may take years.

1445 ULTRASTRUCTURAL ASPECTS OF PRIMARY BILIARY CIRRHOSIS AND OTHER TYPES OF CHOLESTATIC LIVER DISEASE.

(E.) Chedid, A.; Spellberg, M. A.; DeBeer, R. A. (Univ. Cincinnati Sch. Med., Ohio). *Gastroenterology* 67(5):858-869, 1974.

Liver biopsies performed in 7 patients with primary biliary cirrhosis, 5 with extrahepatic obstructive jaundice, 3 with cholestatic viral hepatitis, 2 with chronic aggressive hepatitis, and 2 with other types of cirrhosis, were studied by light and electron microscopy. Serial liver biopsies were available in the 7 patients with primary biliary cirrhosis and these were studied at different stages of the disease. Distinctive features were observed in patients with primary biliary cirrhosis in the small and medium-sized bile ducts. The bile duct epithelium showed intracytoplasmic filamentous structures grouped into bundles which became progressively more abundant and prominent. The mitochondria were swollen and showed fewer circular cristae; the cytoplasm in addition was occupied by numerous cytophagosomes which decreased with the progression of the disease. The rough endoplasmic reticulum was vesicular and ribosomes were few. The luminal microvilli were at first blunted and scanty and finally disappeared. In the final stage, the basement membranes of the bile ducts were disrupted and invaded by polymorphonuclear leukocytes. Changes were observed in hepatocytes as well. At the early stage they contained numerous cytophagosomes, and the mitochondria showed homogenization of their matrix with curling and disappearance of cristae, granules, and prominent crystalline inclusions. These hepatocyte findings vary with the progression of the disease and do not appear to be characteristic. Some of the changes observed in the bile ducts are also seen to a minor degree in other pathological entities, but their prominence and progression are distinctive in primary biliary cirrhosis and suggest that they may be features of possible diagnostic significance when biochemical, clinical, or histological criteria are inconclusive or equivocal.

1446 COPPER AND PRIMARY BILIARY CIRRHOSIS.

(E.) Fleming, C. R.; Dickson, E. R.; Baggenstoss, A. H.; McCall, J. R. (Mayo Clin., Rochester, Minn.). *Gastroenterology* 67(6):1182-1187, 1974.

In an autopsy study, hepatic copper concentrations in primary biliary cirrhosis (8 cases) were compared with those in normal organs (10 subjects), in postnecrotic cirrhosis (15 cases), in alcoholic cirrhosis (13 cases), and in extrahepatic obstruction (10 cases). Tissue copper stores in the spleen, the renal cortex, and the cerebral cortex also were assessed in primary biliary cirrhosis and normals. All copper measurements were done by atomic absorption spectrophotometry. Histological procedures in which hematoxylin and eosin and van Gieson stains were used provided evidence for the presence or absence of regenerative nodules and for the degree of fibrosis. The mean hepatic copper level (441 μg Cu/g dry weight) in primary biliary cirrhosis was significantly greater than that in normal groups (27 μg Cu/g dry weight) and in both groups with cirrhosis (postnecrotic: 57 μg Cu/g dry weight; alcoholic: 13 μg Cu/g dry weight). When multiple random-coded needle biopsy specimens for hepatic copper were obtained in each case of primary biliary cirrhosis, there was only modest variation in copper distribution among specimens, suggesting that a single biopsy adequately reflects elevated Cu levels. In extrahepatic obstruction, hepatic copper levels appeared to increase directly with the duration of obstruction. Compared to normal subjects, patients with primary biliary cirrhosis had greater copper levels in the spleen and renal cortex with normal or only minimally elevated cerebral cortex copper levels. It is suggested that these elevated levels of copper in other major organs probably represent saturation of hepatic stores, overflow into the plasma, and transportation of albumin-bound copper to other tissue depots, and that primary biliary cirrhosis is associated with a more generalized disorder of copper metabolism than was previously thought.

1447 FUNCTIONAL RENAL FAILURE AND HEMODYNAMIC ABNORMALITIES OF CIRRHOSIS. A REVIEW.

(Gr.) Manesis, E. K. (no affil.). *Iatriki* 23(5): 381-393, 1973.

1448 EMERGENCY PORTACAVAL SHUNTS. *(Fr.)* Bergeron, C.; Roberge, R. (Chicoutimi Hosp., Canada). *Union Med. Can.* 103(9):1564-1572, 1974.

1449 CONTROLLED ARTERIALIZATION OF THE LIVER. II. CLINICAL RESULTS. *(Ger.)* Fritsch, A.; Funovics, J.; Gangl, A.; Horak, W.; Grabner, G.; Koha, P. (1st Surg. Clin., Univ. Vienna, Austria). *Langenbecks Arch. Chir.* 336(1):67-89, 1974.

1450 SURGERY FOR PORTAL HYPERTENSION AND LIVER REGENERATION. *(Por.)* Ribeiro, E. B. (Sao Lucas Sanit., Sao Paulo, Brazil). *Bol. Sanatorio Sao Lucas* 35(5):89-91, 1974.

1451 HAEMATEMESIS IN THE AFRICAN: A COMPARISON OF THE TWO MAIN CAUSES AFTER A TEN YEAR INTERVAL. *(E.)* Gelfand, M. (Harare Cent. Hosp., Rhodesia). *Cent. Afr. J. Med.* 20(5):100-101, 1974.

1452 POSTOPERATIVE FIBRINOLYTIC BLEEDING IN CIRRHOSIS. *(Ger.)* Aschauer, R.; Kunz, F.; Constantini, R.; Holzknecht, F. (Med. Clin., Univ. Innsbruck, Austria). *Wien. Klin. Wochenschr.* 86(15):436-438, 1974.

1453 SEX, ASCITES AND ALCOHOLISM IN SURVIVAL OF PATIENTS WITH CIRRHOSIS: EFFECT OF PREDNISONE. *(E.)* Juhl, E.; Winkel, P.; Tygstrup, N. (Univ. Hosp. Copenhagen, Denmark). *Digestion* 10(4/5):310, 1974.

1454 AROUSAL RESPONSE IN HEPATIC ENCEPHALOPATHY WITH L-DOPA. *(E.)* Weiss, A.; Pitman, E. R.; Javdan, P. (Mt. Sinai Hosp. Serv., Elmhurst, N.Y.). *Am. J. Gastroenterol.* 62(6):497-503, 1974.

1455 CHANGES IN LABORATORY FINDINGS IN CHRONIC DISEASES OF THE LIVER DURING INTERMITTENT TREATMENT WITH PURINOR. *(Cz.)* Ondrejicka, M.; Mikulecky, M.; Hantak, I.; Kratochvilova, H. (1st Med. Fac., Comenius Univ., Bratislava, Czechoslovakia). *Bratisl. Lek. Listy* 61(4):413-427, 1974.

1456 IT IS POSSIBLE TO CLINICALLY CURE CIRRHOSIS IN A LARGE PERCENTAGE OF CASES BY TREATMENT WITH LARGE DOSES OF TESTOSTERONE AND VITAMIN B_1. *(It.)* Girolami, M. (Inst. Clin. Trop. Infect. Dis., Univ. Rome, Italy). *Clin. Eur.* 12(4):301-315, 1974.

1457 HYPOCALCEMIA IN CIRRHOSIS. *(Fr.)* Darnis, F.; Cambier, J.; Masson, M.; Lhuillier, M.; Mosse, A. (Beaujon Hosp., Clichy, France). *Ann. Med. Interne (Paris)* 125(5):475-480, 1974.

1458 CLINICAL FORMS AND PATHOGENY OF BANTI'S DISEASE. *(Fr.)* Varay, A. (Rothschild Hosp., Paris, France). *Ann. Gastroenterol. Hepatol. (Paris)* 10(3):227-240, 1974.

1459 INSULIN SECRETION IN HAEMOCHROMATOSIS: ISOLATED ALTERATION OF THE RESPONSE TO GLUCOSE STIMULUS PER OS IN THE EARLY STAGES. *(E.)* Hespel, J. P.; Simon, M.; Lecornu, M.; Bourel, M. (INSERM, Pontchaillou Hosp., Rennes, France). *Digestion* 10(4/5):355, 1974.

See also, 1127, 1146, 1197, 1198, 1199, 1321, 1338, 1341, 1402, 1418, 1423, 1424, 1425.

LIVER AND BILIARY TRACT

Gallbladder and Biliary Tract Diseases

1460 EFFECT OF DIFFERENT DOSES OF CHENODEOXYCHOLIC ACID ON BILE-LIPID COMPOSITION AND ON FREQUENCY OF SIDE-EFFECTS IN PATIENTS WITH GALLSTONES. *(E.)* Mok, H. Y. I.; Bell, G. D.; Dowling, R. H. (R. Postgrad. Med. Sch., London, England). *Lancet* (7875):253-257, 1974.

The effect of various doses of chenodeoxycholic acid (CDA) (250, 500, 750, and 1000 mg/day) on bile-lipid composition and the frequency of side-effects were studied in 38 patients (30 women and 8 men, ranging in age from 22-75 yr) with gallstones. At a dose of 250 mg/day, CDA therapy did not reduce cholesterol saturation of bile in 3 of 7 patients, but treatment with 500 mg/day or more led to a progressive desaturation of bile with cholesterol. While the response of bile-lipid composition to CDA in individual patients was variable, the overall pattern of results suggested that the higher the dose, the greater the reduction in the saturation of bile with cholesterol. Diarrhea was present in 40% of patients taking between 750-1000 mg CDA/day; at these doses SGOT was found to be slightly raised on at least one occasion during monthly checks in 7 of 27 patients. Other studies of liver function and structure, however, were normal, irrespective of dose. On withdrawal of CDA therapy, bile-lipid composition reverted to its supersaturated state, suggesting that once gallstones have been dissolved, long-term maintenance or intermittent CDA therapy may be necessary.

1461 ACCELERATING GALLSTONE DISSOLUTION. *(E.)* Tao, J. C.; Cussler, E. L.; Evans, D. F. (Dep. Chem. Eng., Carnegie-Mellon Univ., Pittsburgh, Pa.). *Proc. Natl. Acad. Sci. USA* 71(10):3917-3921, 1974.

Three experimental methods were used to study the mechanisms responsible for cholesterol gallstone dissolution in bile. The model bile solutions used in these experiments contained various amounts of bile salts, lecithin, cholesterol, and sodium chloride. Discs and spheres of radioactive cholesterol were used as were real gallstones (white or pale yellow spheres) containing more than 90% cholesterol. Dissolution was determined by liquid scintillation counting. The first method, used for rapidly flowing bile, involved a spinning disc of cholesterol immersed in a large volume of bile solution. The second experimental method used a cholesterol sphere or a real gallstone suspended in bile. For studies at high flow, the sphere was suspended in a tube through which bile was steadily pumped at a known rate. For studies at low flow, where free convection is important, the sphere was suspended in an unstirred beaker of bile. The third experimental apparatus, used only for studies in stagnant bile, consisted of a cholesterol slab mounted at the bottom of a cylindrical volume of bile solution. This volume was bounded by identical holes in 4 flat plates, which could be slid apart without causing flow in the vertical direction. The dissolution rates of cholesterol were controlled by diffusion in slowly flowing bile and by interfacial kinetics in rapidly flowing bile. At low flow, dissolution varied with the square root of bile flow and could be predicted, *a priori*, from existing correlations of mass transfer. At high bile flow, dissolution was independent of bile flow and probably dominated by the rate of micelle adsorption. These results indicate that cholesterol gallstone dissolution can be accelerated little in slow bile, but more significantly in rapidly flowing bile.

1462 CHOLEDOCHAL CYST: A REVIEW OF 18 CASES.

(E.) Yue, P. C. K. (Queen Mary Hosp., Hong Kong). *Br. J. Surg.* 61(11):896-900, 1974.

Eighteen cases of choledochal cyst affecting Chinese patients (15 female and 3 male, 53 days to 37-yr old) seen during an 18-yr period are reported. The clinical picture was 1 of 4 types: jaundice as the only feature in infancy; abdominal pain, jaundice and an abdominal mass or an abdominal mass without jaundice, in children and adults; bleeding from esophageal varices due to biliary cirrhosis in terminal cases. A correct preoperative diagnosis was made in 13 cases. Barium meal examination was carried out in 10 and all showed diagnostic features. I.v. cholangiography was performed in 7 cases. The biliary tree was not visualized in 2 cases; in 5 the choledochal cyst and the rest of the biliary tract were outlined. Seventeen patients underwent surgery: 3 had choledochocystojejunostomy, 4 had choledochocystoduodenostomy and 10 had cyst excisions. Three of the 18 patients died, 2 of them after surgery. Five patients had leakage after surgery, 2 being those who died, the other 3 being successfully treated with parenteral nutrition combined with surgery. Of the 12 patients available for follow-up (6 months to 5 yr postoperatively), 2 have had recurrent cholangitis but the other 10 are well. The incidence of choledochal cysts represented by this study is 1 per 5000 hospital admissions, suggesting that the Chinese are more often affected than occidentals among whom the incidence is reported as 1 in 260,000 admissions and 1 in 13,000 admissions in two previously published reports.

1463 THE RESULTS OF CHOLECYSTOSTOMY FOR THE TREATMENT OF ACUTE CHOLECYSTITIS. *(E.)*

Gagic, N.; Frey, C. F. (Wayne Cty. Gen. Hosp., Ann Arbor, Mich.). *Surg. Gynecol. Obstet.* 140(2):255-257, 1975.

Twenty-two cholecystostomies were reviewed to determine whether misuse of the operation accounts for its high mortality rate. Twenty-one patients presented with pain and tenderness in the right upper abdominal quadrant, 7 had a palpable mass, and 6 had jaundice. Cholecystostomy rather than cholecystectomy was performed due to age of patient, to technical difficulties due to inflammation, to gram-negative sepsis, or to presence of renal, cardio-vascular, hepatic or pulmonary disease. All were found to have acute cholecystitis on surgery. Six of the 22 patients died, all from a combination of ascending cholangitis and gram-negative sepsis. It is suggested that survival in ascending cholangitis depends on immediate and adequate bile duct drainage, which is not provided by the operation as performed. It is concluded that the deaths resulted from misuse of the operation, and could have been avoided by use of T-tube drainage of the common bile duct.

1464 BILIARY PERITONITIS WITHOUT PERFORATION OF THE GALLBLADDER IN ACUTE CHOLECYSTITIS.

(E.) Kent, S. J. S.; Menzies-Gow, N. (St. Thomas's Hosp., London, England). *Br. J. Surg.* 61(12):960-962, 1974.

Six cases of biliary peritonitis complicating acute cholecystitis were studied. Five of these had no demonstrable gallbladder perforation, however the gallbladder was either distended, ischemic or both. The average age of the patients was 73, suggesting that the ischemia may have been augmented by arteriosclerosis or low cardiac output. It is concluded that ischemia caused by distension may cause the gallbladder mucosa and overlying peritoneum to become permeable to bile.

1465 BILE PERITONITIS—A REPORT OF FIFTEEN PATIENTS. *(E.)*

Ellis, H.; Adair, H. M. (Westminster Hosp., London, England). *Postgrad. Med. J.* 50(589):713-717, 1974.

Fifteen patients with bile peritonitis are reported with regard to etiology, clinical picture, prognosis, and treatment, and the current literature is reviewed. Of the patients, one suffered traumatic rupture of the gallbladder, 6 had acute cholecystitis, 7 had postoperative leaks, and 1 had a leak after T-tube removal. The clinical picture correlated somewhat with the broad etiological categories. Those cases stemming from perforation in acute cholecystitis presented with widespread peritonitis and acute pain. The non-specific signs and symptoms and the

ndition's rarity made diagnosis difficult. Those
ses resulting postoperatively occasionally presented
re insidiously with mild pain and tenderness. Mor-
lity was typically high (40%). It is suggested
at the high mortality is related to the age of the
tient, length of history, and promptness of treat-
nt. It is also suggested that pre-operative bile
ritonitis be treated surgically. In the postopera-
ve leaks laparotomy is indicated.

66 PRURITIC EFFECT OF BILE SALTS. *(E.)* Kirby,
J.; Heaton, K. W.; Burton, J. L. (Bristol
Infirm., England). *Br. Med. J.* 4(5946):693-695,
74.

ne purified bile salts were tested for their ability
produce pruritus in 24 volunteers. The sodium
lts of cholic, deoxycholic and chenodeoxycholic
ids and their taurine and glycine conjugates were
ch dissolved in phosphate buffered saline (1 mM/
ter); the deoxycholate and chenodeoxycholate acids
re first dissolved in 5% sodium bicarbonate. In 6
bjects, conventional patch and prick tests of each
lution were made. In 20, double blind, randomized
ister base tests were made by injection of each
lution for 2 min into cantharidin-induced blisters.
rmal saline solution and papain diluted 1/10 were
ed as controls. The patch and prick tests were en-
rely negative. The blister base test, in contrast,
used pruritus with all solutions in at least 2 sub-
cts, within 45 sec of injection. The dihydroxy
lts were effective in 56 of 120 tests and the tri-
droxy salts 11 out of 60, a significant difference
at was even greater with unconjugated rather than
njugated salts. The saline solution caused pruritus
none, and the papain in all the subjects. It is
ncluded that bile salts can cause pruritus, the di-
droxy more than the trihydroxy salts.

67 SCLEROSING CHOLANGITIS AND OTHER INTRA-
ABDOMINAL FIBROSES. *(E.)* Thompson,
W.; Read, R. C. (VA Hosp., Little Rock, Arkansas).
. *J. Surg.* 128(6):777-781, 1974.

se histories are presented for 12 patients (11
le, 1 female, 28-75 yr) who had been operated on
r sclerosing cholangitis. All were icteric; the
lirubin levels varied from 2.0-43 ml/100 ml, and
kaline phosphatase levels ranged from 6.8-180
ng-Armstrong U/100 ml, most being over 60.0 U/
0 ml. The most common presenting symptoms were
gue upper abdominal pain and intermittent but pro-
essive jaundice extending up to 3 yr preceding
spitalization. Six of the patients had other di-
ases as well: 3 had stones in the gallbladder; 1
d ulcerative colitis; one had both retroperitoneal
brosis and retractile mesenteritis; and 1 was hy-
rsensitive to a drug. Large nodes along the com-
n bile duct and nonspecific inflammation and fi-
osis in the extrahepatic biliary tree were found.
eration was necessary to diagnose and decompress
e biliary tract. Despite T tube drainage and anti-
otic and steroid therapy, 8 of the patients have
ed. It is concluded that this disease is only one
nifestation of a generalized fibrosis which is
condary to a hypersensitivity vasculitis.

1468 BILE DUCT ADENOMATOSIS OF THE LIVER: A MISLEADING FINDING ON SURGICAL EXPLORATION OF THE ABDOMEN. *(E.)* Levin, S. E.; Dail, D. H.; Saik, R. P. (VA Hosp., San Diego, Calif.). *Am. Surg.* 41(2):106-108, 1975.

A 62 year old man underwent laparotomy for duodenal obstruction. It was noticed that his liver was covered with tan to green-black subcapsular nodules. A biopsy and frozen section diagnosis were immediately performed. The growths were identified as bile duct adenomatosis, benign in nature, and hamartomatous in origin, and not metastases of a possible duodenal neoplasm, as suspected. The duodenal obstruction was found to be due to ulceration. It is suggested that this type of condition be confirmed by frozen section pathology to rule out possible coexistent malignancy.

1469 ANALYSIS OF GALLBLADDER BILE IN MORBID OBESITY. *(E.)* Freeman, J. B.; Meyer, P. D.; Printen, K. J.; Mason, E. E.; DenBesten, L. (Univ. VA Hosp., Univ. Iowa, Iowa City). *Am. J. Surg.* 129(2):163-166, 1975.

The chemical composition of gallbladder bile from morbidly obese patients was compared with that of normal controls to study gallstone etiology in morbid obesity. Bile samples were withdrawn from 11 patients, 100% in excess of ideal weight, during gastric bypass surgery. Samples were also taken from 11 controls undergoing abdominal surgery. All samples were immediately cultured and centrifuged. The bile from the obese patients fell outside the micellar zone (upper limit of cholesterol solubility) while that from the controls fell within the zone, with 1 exception. Cholesterol crystals were found from 4 of the obese patients and from none of the controls. In the obese patients the bile concentrations of cholesterol, phospholipids and bile salts were 26, 51.7 and 131 mM/liter resp., while the corresponding values in the controls were 15.0, 40.0, and 169.0 mM/liter. The cholesterol solubilizing capacity of the bile expressed as the lithogenic index was 6.3 in the obese and 14.8 in the control patients. It is concluded that since the bile of the obese patients was supersaturated with cholesterol, the previous correlations of obesity with gallstone formation are substantiated.

1470 EVALUATION OF THE RESULTS OF POSTOPERATIVE CHOLANGIOMANOMETRY PERFORMED DURING DRAINAGE. *(Rus.)* Porembskii, O. B.; Bronshtein, E. L. (S. M. Kirov Mil. Med. Acad., Leningrad, USSR). *Klin. Khir.* (7):9-13, 1973.

Expediency of a temporary bile drainage after biliary duct surgery was investigated. Studies included measurements of duct pressure which depends on the functional condition of Oddi's sphincter, secretory action of the liver and pancreas, and intestinal emptying. Seventy-six patients were studied after cholecystotomy; 34 also had choledochotomy. Surgery included temporary bile drainage through the stump of the gallbladder duct. Cholangiomanometry was first performed 6-8 hr after surgery, then each morning before the removal of the drain. The critical pressure was close to normal in most cases. Maximum pressure (185 mm H_2O) was reached 4-6 days after surgery. On the 4th day, edema of duodenal papilla was reduced. Nitroglycerin contributed to greater flow capacity of the duodenal papilla accompanied by the onset of Oddi's sphincter dystonia. Comparison of cholangiographic data during drainage and cholangiomanometry performed 7-15 days after surgery indicated that following the restoration of permeability of the terminal part of the bile duct, bile excretion through the drain did not stop. Cholangiomanometry showed obstruction of the bile ducts while the contrast medium was retained in the duodenum for 3-5 min (normally, 30 sec). Impairment of duodenal emptying resulted in rising pressure which can account for the biliary hypertension after the restoration of Oddi's sphincter. Temporary bile drainage is recommended after surgery to prevent postoperative ductal hypertension.

1471 HEPATICOGASTROSTOMY: ULCEROGENIC PREPARATION OR THERAPEUTIC ALTERNATIVE. *(E.)* Warren, K. W.; Harmon, J. W. (Lahey Clin. Found., Boston, Mass.). *Ann. Surg.* 181(1):5-8, 1975.

Seven cases of hepaticogastrostomy for biliary obstruction were reviewed to determine whether the operation led to gastric ulceration. Three had been operated on for benign obstruction, 3 for malignant obstruction, and 1 for a congenital anomaly. Jaundice was relieved in 5 of the cases (71%); results were unsatisfactory in 1 and unknown in 1. Two of the patients developed upper gastrointestinal tract hemorrhage. One died, but the other recovered to live 2 yr and 4 months with no further hemorrhage. Four patients showed no signs of ulceration during follow-up periods ranging from 4 months to 21 yr. It is concluded that this operation has a high rate of success, despite theoretical considerations, and has definite merit as a bypass operation.

1472 GALLSTONE DISEASE. *(E.)* Coyne, M. J.; Schoenfield, L. J. (Cedars-Sinai Med. Cent., Los Angeles, Calif.). *Postgrad. Med.* 57(1): 153-162, 1975.

1473 PATHOGENESIS OF GALLSTONE FORMATION IN MAN: A REVIEW. *(E.)* Goswami, S. K.; Frey, C. F. (Dep. Surg., Univ. Michigan, Ann Arbor). *Univ. Michigan Med. Cent. J.* 40(1):32-37, 1974.

1474 CHOLELITHIASIS. *(Fl.)* Fevery, J. (St. Rafael Gen. Hosp., Louvain, Belgium). *Tijdschr. Geneesk.* 29(14):657-664, 1973.

1475 PATHOPHYSIOLOGY OF CHOLELITHIASIS. *(E.)* Redinger, R. N. (Univ. West. Ontario Fac. Med., London, Canada). *Schweiz. Med. Wochenschr.* 104(47):1673-1679, 1974.

1476 CHOLELITHIASIS AND ILEAL PATHOLOGY IN CHILDHOOD. *(E.)* Pellerin, D.; Bertin, P.; Nihoul-Fekete, C.; Ricour, C. (Necker Hosp. Sick Child., Paris, France). *J. Pediatr. Surg.* 10(1 35-41, 1975.

1477 CHOLESTEROL GALLSTONES: PATHOGENESIS AND MEDICAL TREATMENT. *(Fr.)* Shaffer, E. A.; Beaudoin, M. (Montreal Gen. Hosp., Canada). *Union Med. Can.* 103(12):2061-2068, 1974.

1478 CHOLEDOCHOLITHIASIS: ADVANCES AND OUTLOOK FOR SURGICAL TREATMENT. *(Fr.)* Ryncki, P. V. (Dep. Surg., Univ. Lausanne, Switzerland). *Schweiz. Med. Wochenschr.* 104(47):1684-1694, 1974.

1479 VARIATION OF HEPATIC BILE COMPOSITION FOLLOWING CHOLECYSTECTOMY IN PATIENTS WITH PREVIOUS GALLSTONES. *(E.)* Boyer, J. L.; Bloomer, J. R.; Maddrey, W. C.; Tilson, D. (Yale Univ. Sch. Med., New Haven, Conn.). *Yale J. Biol. Med.* 47(4):211-217, 1974.

1480 DIAGNOSIS AND TREATMENT OF ENTEROBILIARY FISTULAS IN CHOLELITHIASIS. *(Rus.)* Panchenkov, R. T.; Lezhnev, A. N. (Moscow Inst. Med. Stomatol., USSR). *Khirurgiia (Mosk.)* (11):57-63, 1973.

1481 EXPERIMENTAL STUDIES ON FACTORS INITIATING PANCREATITIS ASSOCIATED WITH GALLSTONES, ESPECIALLY CHOLESTEROL STONES. *(Jpn.)* Yamazaki, H. (Kyoto Univ. Med. Sch., Japan). *Arch. Jpn. Chir.* 42(2):169-183, 1973.

1482 SPASM AND OPERATIVE CHOLANGIOGRAPHY. *(E.)* Chessick, K. C.; Black, S.; Hoye, S. J. (Tufts Univ. Sch. Med., Medford, Mass.). *Arch. Surg.* 110(1):53-57, 1975.

1483 INTRAOPERATIVE CHOLANGIOGRAPHY: CAUSES OF TECHNICAL ERRORS. *(Pol.)* Poltorak, J.; Wiechno, W.; Zakrzewski, M. (Bielanski Hosp., Warsaw, Poland). *Wiad. Lek.* 27(10):861-864, 1974.

1484 PERCUTANEOUS TRANSHEPATIC CHOLANGIOGRAPHY IN THE MANAGEMENT OF OBSTRUCTIVE JAUNDICE. *(E.)* Legge, D. A.; Hennessy, T. (St. Finbarr's Hosp., Cork, Ireland). *Ir. J. Med. Sci.* 144(1): 30-43, 1975.

1485 SOME PATHOGENETIC PRINCIPLES FOR SURGICAL TACTICS IN THE TREATMENT OF OBSTRUCTIVE JAUNDICE. *(Rus.)* Napalkov, P. N.; Vitlin, V. I. (Leningrad Med. Inst. Sanit. Hyg., USSR). *Khirurgiia (Mosk.)* (11):33-38, 1973.

1486 SKIN PROLYL HYDROXYLASE IN PATIENTS WITH OBSTRUCTIVE JAUNDICE. *(E.)* Than, T.; McGee, J. O'D.; Sokhi, G. S.; Patrick, R. S.; Blumgart, L. H. (R. Infirm., Glasgow, Scotland). *Lancet* 2(7884):807-808, 1974.

1487 CHOLEDOCHAL CYSTS. A REVIEW OF THE CYSTIC ANOMALIES OF THE BILIARY TREE. *(E.)* Olbourne, N. A. (Northwick Park Hosp., Harrow, England). *Ann. R. Coll. Surg. Engl.* 56(1):26-32, 1975.

1488 EXPERIENCE WITH CHOLEDOCAL [SIC!] CYST. *(E.)* Valayer, J.; Alagille, D. (St. Vincent de Paul Hosp., Paris, France). *J. Pediatr. Surg.* 10(1):65-68, 1975.

1489 WAYS TO DECREASE THE MORTALITY RATE IN ACUTE CHOLECYSTITIS IN ELDERLY PATIENTS. *(Rus.)* Struchkov, V. I.; Lokhvitskii, S. V.; Misnik, V. I. (I.M. Sechenov 1st Moscow Med. Inst., USSR). *Khirurgiia (Mosk.)* (11):39-44, 1973.

1490 ACUTE ACALCULOUS CHOLECYSTITIS. *(Fr.)* Favre, J. P.; Perrin, M.; David, M.; Piganiol, G.; Viard, H. (Bocage Hosp., Dijon, France). *Lyon Chir.* 70(5):307-309, 1974.

1491 ACUTE CHOLECYSTITIS IN CHILDREN. *(E.)* Pieretti, R.; Auldist, A. W.; Stephens, C. A. (Hosp. Sick Child., Toronto, Canada). *Surg. Gynecol. Obstet.* 140(1):16-18, 1975.

1492 A COMPARATIVE APPRAISAL OF EMPHYSEMATOUS CHOLECYSTITIS. *(E.)* Mentzer, Jr., R. M.; Golden, G. T.; Chandler, J. G.; Horsley, III, J. S. (Dep. Surg., Univ. Virginia, Charlottesville). *Am. J. Surg.* 129(1):10-15, 1975.

1493 THE SIGNIFICANCE OF ELECTROMANOMETRY TO ASSESS BENIGN DISEASES OF THE PAPILLA OF VATER. *(E.)* Boeckl, O.; Hell, E.; Laszcz, M.; Zimmermann, G. (Oberndorf Hosp., Salzburg, Austria). *Eur. Surg. Res.* 6(Suppl. 1):56-57, 1974.

1494 DIAGNOSIS AND TREATMENT OF CANCER OF THE PAPILLA OF VATER. *(Rus.)* Shkrob, O. S.; Lopata, Iu. M.; Safronov, V. V. (I.M. Sechenov 1st Moscow Med. Inst., USSR). *Khirurgiia (Mosk.)* (11):50-57, 1973.

1495 MALIGNANT NEOPLASMS OF THE GALLBLADDER. *(Rus.)* Dasaev, A. N.; Goriacheva, P. I.; Pushkin, L. N. (no affil.). *Khirurgiia (Mosk.)* (1):78-79, 1974.

1496 PRIMARY CARCINOMA OF THE GALLBLADDER. *(E.)* Prakash, A. T. M.; Sharma, L. K.; Pandit, P. N. (All India Inst. Med. Sci., New Delhi). *Br. J. Surg.* 62(1):33-36, 1975.

1497 INTRAHEPATIC BY-PASS OPERATIONS IN CARCINOMA OF THE BILIARY TRACT. *(Fr.)* Patel, J. C.; Chapuis, Y.; Delaitre, B.; Desvignes, G.; Paulian, B. (Cochin Hosp., Paris, France). *J. Chir. (Paris)* 107(5/6):521-536, 1974.

1498 BILIARY TRACT CARCINOMA INVOLVING THE AMPULLA OF VATER AND THE PANCREATIC DUCT TREATED BY RADICAL LEFT HEPATECTOMY AND DUODENOPANCREATECTOMY IN ONE STAGE. *(Fr.)* Marchal, G.; Vernette, M.; Roustan, J.; Henry, G. (no affil.). *J. Chir. (Paris)* 107(5/6):555-578, 1974.

1499 AGENESIS OF THE GALLBLADDER: REPORT OF TWO CASES. *(E.)* Sachdeva, H. S.; Agrawal, B. K.; Mittal, V. K. (Postgrad. Inst. Med. Educ. Res., Chandigarh, India). *Am. Surg.* 41(2):109-110, 1975.

1500 TORSION OF THE GALLBLADDER. *(E.)* Neher, R. G.; Warner, G. W. (St. Benedict's Hosp., Jerome, Idaho). *Abdom. Surg.* 17(2):32-35, 1975.

1501 BILE LAKES IN CONGENITAL BILIARY ATRESIA. *(E.)* Fonkalsrud, E. W.; Arima, E. (Univ. California Sch. Med., Los Angeles). *Surgery* 77(3):384-390, 1975.

1502 VARIATIONS AND ANOMALIES OF THE PAPILLA OF VATER, THE PANCREAS AND THE BILIARY DUCT SYSTEM. *(E.)* Phillip, J.; Koch, H.; Classen, M. (Dep. Med., Univ. Erlangen-Nuremberg, Erlangen, Germany). *Endoscopy* 6(2):70-77, 1974.

1503 A CASE OF ANOMALOUS BILE DUCT ASSOCIATED WITH CHOLELITHIASIS. *(E.)* Nagase, M.; Kido, S.; Detoyama, M.; Fujimura, M. (Yamato-Takada City Hosp., Japan). *Arch. Jpn. Chir.* 42(4):377-380, 1973.

1504 CHOLECYSTOHEPATIC SERENDIPITY. *(E.)* Fentiman, I. S.; Ramsay, G. S. (R. London Homoeopath. Hosp., England). *Br. J. Clin. Pract.* 29(1):21-22, 1975.

1505 PAIN REFERABLE TO THE BILIARY TRACT AND HYPERPLASIA OF THE GALLBLADDER MUCOSA. *(Fr.)* Jekic, M. (Zemun Clin. Hosp., Belgrade, Yugoslavia). *Helv. Chir. Acta* 41(5/6):825-828, 1974.

1506 AN ABERRANT RIGHT HEPATIC DUCT DISCHARGING INTO THE NECK OF THE GALLBLADDER. *(It.)* Fedele, E. (Nuovo Regina Margherita Hosp., Rome, Italy). *Chir. Gastroenterol.* 8(1):104-113, 1974.

1507 RADIOLOGICAL DIAGNOSIS OF HYPERPLASTIC GALLBLADDER DISEASE. *(Ger.)* Peter, M.; Vargha, G.; Fedor, E.; Bekesi, L. (Med. Univ., Debrecew, Hungary). *Radiol. Diagn. (Berl.)* 14(5):567-574, 1973.

1508 DIFFERENTIATION BETWEEN LABILE AND PERSISTENT HYPERTENSION OF THE SPHINCTER OF ODDI. *(Fr.)* Clemens, M. (Karcag Hosp., Hungary). *Lyon Chir.* 70(4):232-233, 1974.

1509 EVALUATION OF X-RAY CONTRAST AND INSTRUMENTAL INVESTIGATIONS IN BILIARY TRACT SURGERY. *(Rus.)* Belichenko, I. A.; Obukhov, V. A.; Gorbunov, V. V. (Moscow Inst. Med. Stomatol., USSR). *Khirurgiia (Mosk.)* (11):63-67, 1973.

1510 ENTEROBILIARY ANASTOMOSES IN BILIARY TRACT SURGERY. *(Rus.)* Kalchenko, I. I.; Lys, P. V.; Khokholia, V. P. (Kiev Inst. Postgrad. Med., USSR). *Khirurgiia (Mosk.)* (11):44-50, 1973.

1511 ENTEROBILIARY ANASTOMOSES. *(Ger.)* Haas, D.; Vogt, B. (Canton. Hosp., Lucerne, Switzerland). *Helv. Chir. Acta* 41(5/6):819-821, 1974.

1512 ERRORS AND COMPLICATIONS IN SURGERY OF THE GALLBLADDER EXTRAHEPATIC BILIARY TRACT. *(Rus.)* Shuvayeva, V. I. (M. F. Vladimirskii MONIKI, Moscow, USSR). *Khirurgiia (Mosk.)* (11):121-126, 1973.

1513 TRANSDUODENAL PAPILLOTOMY: SURGICAL TECHNIQUE, INDICATIONS, AND RESULTS. *(Ger.)* Willenegger, H.; Kaiser, C.; Roth, B.; Muller, J. (Liestal Canton. Hosp., Switzerland). *Helv. Chir. Acta* 41(5/6):808-813, 1974.

1514 PAPILLOTOMY USING THE SOLER-ROIG CATHETER. *(Ger.)* Thalmann, H.; Roth, H. (Canton. Hosp., Munsterlingen, Switzerland). *Helv. Chir. Acta* 41(5/6):823-824, 1974.

1515 EARLY COMPLICATIONS AFTER PAPILLOTOMY. *(Pol.)* Wladzinski, J. (Mil. Med. Acad., Lodz, Poland). *Wiad. Lek.* 27(7):619-623, 1974.

1516 INDICATIONS FOR AND RESULTS FROM THE ROUX-EN-Y PROCEDURE USING A LONG JEJUNAL LOOP FOR THE COMMON BILE DUCT. *(Ger.)* Schweingruber, B.; Gemsenjager, E.; Meier, A. L. (St. Clara Hosp., Basel, Switzerland). *Helv. Chir. Acta* 41(5/6):815-817, 1974.

1517 CHOLEDOCHODUODENOSTOMY AND SPHINCTEROPLASTY. *(Afr.)* Fichardt, J. B.; De Villiers, D. R.; Bornman, P. C. (Dep. Surg., Orange Free State Univ., Bloemfontein, South Africa). *S. Afr. Med. J.* 48(59): 2457-2459, 1974.

1518 REFLUX OF THE DUODENAL CONTENTS INTO THE BIL DUCTS FOLLOWING CHOLEDOCHODUODENOSTOMY. *(Pol.)* Kondrak, R.; Syc, S. (Prov. Hosp., Opole, Poland). *Wiad. Lek.* 27(5):435-438, 1974.

1519 PROGRESS IN BILIARY STRICTURE REPAIR. *(E.)* Braasch, J. W.; Warren, K. W.; Blevins, P. K. (Lahey Clin. Found., Boston, Mass.). *Am. J. Surg.* 129(1):34-37, 1975.

1520 PLASTIC REPAIR OF THE COMMON BILE DUCT BY A PEDUNCULATED FRAGMENT OF THE GALLBLADDER. *(Fr.)* Sandblom, P.; Tabrizian, M. (Dep. Surg. B., Univ. Lausanne, Switzerland). *Helv. Chir. Acta* 41(5/6):789-792, 1974.

1521 PROBLEMS OF INTRAOPERATIVE FUNCTIONAL DIAGNOSIS OF SPHINCTER ODDI. *(E.)* Lynen, F. K. (Med. Fac., Rhenish-Westphal. Tech. Univ., Aachen, Germany). *Eur. Surg. Res.* 6(Suppl. 1):54-55, 1974.

1522 THE BIOLOGICAL CHARACTERISTICS OF STAPHYLOCOCCI ISOLATED FROM BILE DURING CHRONIC DISEASES OF THE GALLBLADDER AND BILE DUCTS. *(Rus.)* Orzhonikidze, Z. V.; Kurashvili, V. E.; Salakaia, R. G. (Tbilisi State Inst. Postgrad. Med., USSR). *Soobshch. Akad. Nauk Gruzinsk. SSR* 76(2):465-468, 1974.

1523 THE EFFECT OF PENTAZOCINE ON THE FUNCTION OF THE SPHINCTER OF AMPULLA OF VATER. *(Pol.)* Zakrzewski, M.; Poltorak, J. L.; Ruka, W. (Bielanski Hosp., Warsaw, Poland). *Pol. Tyg. Lek.* 29(14):585-586, 1974.

See also, 0926, 1093, 1136, 1138, 1147, 1148, 1168, 1174, 1191, 1202, 1203, 1204, 1205, 1206, 1207, 1208, 1209, 1210, 1240, 1283, 1287, 1328, 1329, 1357, 1403, 1422, 1445, 1548, 1556.

GENERAL

1524 CALCIUM INFUSION TEST BEFORE AND AFTER TOTAL GASTRECTOMY IN THE ZOLLINGER-ELLISON SYNDROME. *(E.)* Morrow, D. J; Passaro, Jr., E. (VA Wadsworth Hosp. Cent., Los Angeles, Calif.). *Am. J. Surg.* 129(1):62-66, 1975.

Data were obtained on calcium infusion studies in Zollinger-Ellison patients before and after total gastrectomy to further document the value of the test in establishing the diagnosis in the absence of significant hypergastrinemia. Prior to total gastrectomy, 14 patients with Zollinger-Ellison syndrome underwent calcium gluconate infusion at the rate of 5 mg of elemental calcium/kg/hr over a 3 hr period. Eleven Zollinger-Ellison patients were studied with a calcium infusion after total gastrectomy. Before total gastrectomy, the basal serum gastrin levels ranged from 100 to 6000 pg/ml. The basal acid secretion ranged from 4.5 to 34 mEq/hr. Calcium infusion produced a mean increase in serum gastrin concentration of 106% and a mean increase in acid secretion of 280%. Maximal serum gastrin increases over basal were 41 to 900% after calcium infusion. The 11 patients who had total gastrectomy were able to be subdivided into 3 groups based on their basal serum gastrin levels and their responses to calcium infusion. In the first group, 4 patients demonstrated an increase in serum gastrin concentration of 100% or more. At least 3 of these 4 had residual tumor after total gastrectomy. These same 3 patients had basal postoperative serum gastrin levels below 250 pg/ml. In the second group were 4 patients whose basal serum gastrin levels were elevated and not altered by induced hypercalcemia. Two of these died of the disease, both with extensive hepatic metastases at autopsy. A third is doing well 8 yr later, despite known pancreatic tumor and extensive hepatic metastases. The 4th is well, 6 yr after operation. In the third group were 3 patients each having a low basal serum gastrin concentration which did not increase with calcium infusion. Either no tumor was found or all known tumor was removed in these patients. It is concluded that in a preoperative group of patients the serum gastrin and gastric acid response to calcium infusion may be highly diagnostic. After total gastrectomy, the gastrin response to such infusion correlates well with presence or absence of tumor.

1525 LONG-TERM EVALUATION OF THE CELIAC BAND SYNDROME.

(E.) Evans, W. E. (Ohio State Univ. Hosp., Columbus). *Surgery* 76(6):867-871, 1974.

Fifty-nine patients (49 women and 10 men, aged 13-68 yr) with celiac compression syndrome were observed for 3 to 11 yr following their initial diagnoses. Operations were performed on 47 of these patients; the other 12 were treated nonsurgically. Operation consisted of division of the median arcuate ligament and clearing of all tissue overlying the celiac axis. Over 70% of these patients had had a previous abdominal operation without relief of their symptoms and all had long histories of abdominal complaints. Of the 47 who underwent celiac band release, 3 had cholecystectomy simultaneously. Additional subsequent abdominal procedures have been performed on 13 patients. During the first 6 months after surgery, 39 patients (83% of those undergoing only celiac band release) were asymptomatic, while 8 (17%) were not improved. At the end of the follow up period, only 41% remained symptom free. Fifty percent were not benefited at all. Eight of these underwent additional surgery and are now symptom free. Of the 12 patients treated nonsurgically, 9 (75%) are asymptomatic, 1 is improved, and only 2 continue to be symptomatic. Of the pain free group, 4 responded to psychiatric treatment, and 3 became symptom free when taken off milk products. There was no correlation between symptoms and the results of either surgical or nonsurgical treatment. These results suggest that compression of the celiac artery cannot likely be implicated as an identifiable syndrome causing abdominal pain. A skeptical and cautious approach to these patients is suggested.

1526 INTESTINAL MANIFESTATIONS OF FABRY'S DISEASE.

(E.) Rowe, J. W.; Gilliam, J. I.; Warthin, T. A. (West Roxbury VA Hosp., Mass.). *Ann. Intern. Med.* 81(5):628-631, 1974.

The radiographic and clinical manifestations of intestinal involvement in 4 patients (all men, aged 31-50 yr) with Fabry's disease are presented. Histologic studies in 2 of these cases revealed normal small and large intestinal mucosa with accumulation of glycolipid in autonomic ganglia, neurons of myenteric plexuses, and smooth muscle cells and blood vessels. Episodic diarrhea was a prominent complaint in 3 of these 4 patients. In 1 patient, diarrhea was the only clinical manifestation. These attacks were unpredictable in onset or duration, progressive in frequency and severity, and were often associated with crampy abdominal pain, and remitted spontaneously. The stools were loose, free of blood, of normal color, and were not buoyant or foul smelling. Results of sigmoidoscopy were normal. There was no strong clinical or chemical evidence of malabsorption in any patient, although 1 was studied while his bowel symptoms were in remission. Radiologic studies revealed similar changes in the small and large bowels of all 4 patients. Small bowel changes consisted of thickening of folds and mild dilatation throughout and the presence of an unusual granular appearance of the ileum. Barium enemas showed loss of the colonic haustral markings, particularly in the more distal colonic segments. Serial studies on the symptomatic patients, before and after the onset of diarrhea, showed progression of the radiographic changes. There was no evidence of malabsorption or gastrointestinal blood loss in any patient. It is suggested that intestinal involvement, either silent or clinically evident, may be more common in Fabry's disease than has been previously recognized.

1527 ULTRASTRUCTURAL STUDIES OF THE PAROTID GLANDS IN PAROTID SWELLING.

(Ger.) Donath, K.; Seifert, G. (Inst. Pathol., Univ. Hamburg, Germany). *Virchows Arch.* [*Pathol. Anat.*] 365(2):119-135, 1975.

1528 END RESULTS OF SURGICAL TREATMENT OF 622 TUMORS OF THE SALIVARY GLANDS.

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GENERAL

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1579 INVESTIGATION OF MUCOPROTEINS IN CHRONIC ENTEROCOLITIS. *(Rus.)* Silchenko, T. S.; Vashchenko, G. S. (Dnepropetrovsk Sci. Res. Inst. Gastroenterol., USSR). *Vrach. Delo* (10):35-38, 1974.

1580 THERAPEUTIC EFFICIENCY OF METHYLMETHIONINE SULFONIUM CHLORIDE (VITAMIN U) IN PATIENTS WITH CHRONIC ENTEROCOLITIS. *(Rus.)* Trusov, V. V.; Vakhrushev, Ia. M. (Izhevsk Med. Inst., USSR). *Vrach. Delo* (12):78-82, 1974.

See also, 1132, 1134, 1151, 1152, 1155, 1167, 1178, 1214, 1217, 1289, 1426, 1522.

GENERAL

Parasitology

1581 LOCALIZATION OF THE CIRCULATING ANTIGEN WITHIN THE GUT OF Schistosoma mansoni. *(E.)* Nash, T. E. (Natl. Inst. Allergy Infect. Dis., Bethesda, Md.). *Am. J. Trop. Med. Hyg.* 23(6):1085-1087, 1974.

The indirect immunofluorescent technique was used to determine the location of the antigen in adult *Schistosoma mansoni* which appears in the circulation of mice and hamsters heavily infected with *S. mansoni* or *S. japonicum.* Antisera to the circulating antigen was raised by immunizing rabbits with a trichloroacetic acid soluble-chloroform insoluble fraction of adult *S. mansoni* coupled to methylated bovine serum albumin. Sections of adult *S. mansoni* and of infected mouse liver were incubated with this monospecific antiserum for 30 min at room temperature, followed by treatment with a 1:10 dilution of fluorescein conjugated goat anti-rabbit immunoglobulin G. Controls included slides treated with only normal rabbit serum, only conjugate, or neither normal rabbit serum or conjugate. Specific immunofluorescent staining was not observed in any of the controls. However, with antiserum the border of the intestinal lining cells of the cecum with the lumen fluoresced very brightly, the lining cells themselves fluoresced to a lesser degree and the gut contents fluoresced occasionally. This corresponds to an area of diastase-fast periodic acid-Schiff positive staining, which confirms previous data indicating that this antigen is a polysaccharide. The antigen was not found elsewhere in the worms or in the liver of infected mice. These results indicate that the circulating antigen is localized to the lining cells of the cecum in male and female schistosomes, but as yet no physiological function can be ascribed to it.

1582 ANTIBODY-DEPENDENT CELL-MEDIATED DAMAGE TO SCHISTOSOMULA IN VITRO. *(E.)*

Butterworth, A. E.; Sturrock, R. F.; Houba, V.; Rees, P. H. (Wellcome Trust Res. Labs., Nairobi, Kenya). *Nature* 252(5483):503-505, 1974.

The ^{51}Cr-release technique was adapted to assay damage to schistosomula of *Schistosoma mansoni in vitro* and used to provide evidence that normal human peripheral blood leukocytes, in the presence of sera from patients infected with *S. mansoni*, can damage labeled schistosomula in the absence of added complement. After overnight storage of schistosomula, the organisms were labeled with ^{51}Cr-sodium chromate by incubation of 10^4 organisms with 0.5-1 mCi of ^{51}Cr in a volume of less than 0.5 ml for 3-4 hr at 37 C. This procedure gave count rates of 50-300 c.p.s./100 organisms. Serum samples were obtained from patients with a long history of presumptive exposure to *S. mansoni* and from laboratory workers with no known exposure. The cytotoxicity test was carried out in a total volume of 0.3 ml in 38 x 7 mm sterile plastic tubes. At the end of the incubation period, 0.15 ml of the supernatant was removed, and both cell and supernatant tubes counted for ^{51}Cr. Cells alone, at a multiplicity of 2,000:1 to the target organisms, caused a slight increase in isotope release. Cells in combination with antibody caused a marked increase in isotope release which was significantly different from the effect of cells alone from 2 hr of incubation. By 19 hr, isotope release in the presence of cells and antibody was beginning to show a plateau effect. A total of 11 test sera and 4 control sera were examined. None of the sera was toxic for schistosomula in the absence of added leukocytes. These results indicate that schistosomula can be damaged *in vitro* by normal human peripheral blood leukocytes together with sera from infected patients but not with sera from control subjects. The effect is complement-independent in that heat-inactivated sera were used throughout. Preliminary observations indicate that maximum cytotoxic activity is associated with an eosinophil-rich polymorphonuclear leukocyte fraction.

1583 SCHISTOSOMIASIS IN NEW YORK CITY. *(E.)*

Welton, J.; Imperato, P. J. (Dep. Health, New York City, N.Y.). *Bull. NY Acad. Med.* 51(2): 263-271, 1975.

During the 14-yr period from 1960 through 1973, a total of 3,643 cases of schistosomiasis were reported in New York City. Between 1960 and 1973 the number of cases reported annually declined by 66.4%. This decline is closely tied to changing immigration patterns and to the development of programs for the control and treatment of schistosomiasis in Puerto Rico. A rise in reported cases was noted in Brooklyn in the last 3 years, due to infections among the growing number of recent Yemenite immigrants occupying the Bushwick area. The majority of schistosomiasis cases have been reported from Brooklyn, Manhattan and the Bronx, the areas which harbor most recent immigrants from endemic areas. The majority of cases were diagnosed in adults between 20 and 44 yr of age (2,027 cases, 76.5%). Children less than 15 yr of age accounted for only 10.8%. This age distribution reflects the age distribution of the immigrant population. For the 12-yr period from 1960 through 1971, the male-to-female ratio was 1.9:1. Among Yemenites in Brooklyn, this ratio was 12.6:1. An analysis of surnames between 1970 and 1973 revealed that patients with Spanish surnames have comprised about 90% of all cases in the Bronx. In Manhattan the proportion with Spanish surnames declined from 92.3% in 1970 to 77.2% in 1973. The vast majority of cases of schistosomiasis reported in New York City during the period of study were *Schistosoma mansoni* infections. Several cases of *Schistosoma haematobium* were reported, but none of *Schistosoma japonicum*. It is concluded that the epidemiologic pattern of schistosomiasis in New York City will be determined by future immigration and by the effectiveness of schistosomiasis control programs in endemic areas.

1584 TINIDAZOLE IN THE TREATMENT OF INTESTINAL AMOEBIASIS. *(E.)*

Islam, N.; Hasan, M. (Inst. Postgrad. Med. Res., Dacca, Bangladesh). *Curr. Ther. Res.* 17(2):161-165, 1975.

Fifty patients with chronic intestinal amebiasis (35 males and 15 females, aged 17-60 yr) were treated with tinidazole. The duration of symptoms varied from less than 2 months to 2 yr. Nine cases were asymptomatic and 4 had associated diseases so that the duration of symptoms could not be ascertained. Tinidazole was given as a single dose of 2000 mg/day after meals for 3 consecutive days. Parasitic cure was obtained in 49 cases, clinical cure in 44, both clinical and parasitic cure in 43 (86%). Side effects included anorexia (5 cases), nausea (2), general malaise (10), and metallic taste in the mouth (3). No withdrawal of therapy was necessitated by these minor side effects. It is suggested that the advantages of a daily single dose of tinidazole as opposed to 2 or 3 divided doses are obvious, provided side effects are minimal. The single dose has the theoretical advantage of having a higher serum peak level with perhaps greater amebicidal effect. These results indicate that tinidazole used as described may not be inferior to metronidazole. In 4 of these cases, hepatic amebiasis was present, but did not necessitate lengthening the therapy except in one case, where the therapy was repeated. It is suggested that this regime may be sufficient for the treatment of mild to moderate hepatic amebiasis.

In moderately severe cases treatment may have to be prolonged along with aspiration until satisfactory control is obtained.

1585 HEPATIC INVOLVEMENT IN AMOEBIASIS. *(E.)* Kasliwal, R. M. (Med. Coll., Jaipur, India). *Am. J. Proctol.* 26(1):43-48, 1975.

The question of whether some cases of so-called chronic hepatitis and cirrhosis have an amebic background was investigated using a group of 60 patients. These patients were divided into 4 groups. Group I showed hepatomegaly ranging from 1 to 3 fingers enlarged (19 patients); Group II, amebic hepatitis (13); Group III, liver abscess, amebic (5); and group IV, cirrhosis (23). An Indirect Hemagglutination Test (IHA) was performed on each patient. Of the 13 patients with chronic hepatitis suspected to be of amebic origin, 10 showed a positive IHA test. Of the 23 patients with cirrhosis, 8 showed a positive IHA test. In the hepatomegaly cases of non-amebic origin, all 19 cases had a negative IHA test and all 5 cases of liver abscess of amebic origin had a strongly positive IHA test. Of the 8 cirrhotics with positive IHA test results, 4 improved very much and were discharged as cured on anti-infective, anti-amebic and steroid therapy. Two others showed partial improvement and 2 responded initially but, after 2 1/2 months, did not show sustained improvement. It is noted that in those cases where the IHA test was positive in high dilutions, the patients did not show much improvement, whereas in those in whom the IHA test was positive in low titers, the prognosis was better and the patients responded to treatment. Thus the IHA test may be of prognostic as well as diagnostic value. These findings suggest the possibility that some of the cases of chronic hepatitis and cirrhosis found particularly in an endemic area may have an amebic background. It is urged that in patients with chronic hepatitis and cirrhosis where an obvious etiological background is not found, there be a thorough exploration for a possible amebic infection.

1586 RECENT EXPERIENCE WITH HEPATIC AMEBIASIS. SUCCESSFUL TREATMENT WITH METRONIDAZOLE. *(E.)* Wadlington, W. B.; Faber, R.; O'Neill, Jr., J. A. (Vanderbilt Univ. Med. Cent., Nashville, Tenn.). *Clin. Pediatr.* 14(2):163-170, 1975.

A 4-yr old girl was admitted with a 3 week history of weight loss and fever and a one-week history of jaundice. The liver was palpable 5 cm below the costal margin. No ova or parasites were seen in the stool. A chest x-ray showed a slightly elevated right diaphragm with infiltrates in the right lower lobe. Abdominal films demonstrated an enlarged liver. Liver scan showed a right posterosuperior filling defect, interpreted as an abscess. The abscess was aspirated and when stained the pus showed *Entamoeba histolytica.* The child received metronidazole (50 mg/kg/day, or 750 mg/day, for 5 weeks). She became afebrile in 4 days and began to gain weight. A liver scan performed 5 weeks after initial studies was normal. A 5 yr old boy was hospitalized in shock, jaundice, and extreme lethargy. Three weeks earlier he had complained of right upper quadrant pain. The liver was tender, large and extended almost to the right iliac crest. Abdominal films demonstrated an enlarged liver. Liver scan demonstrated a large filling defect of the right lobe of the liver which was aspirated and the stained material showed both *E. histolytica* and gram-positive cocci. The culture grew out *Staphylococcus aureus.* He received metronidazole (50 mg/kg/day, or 750 mg/day) and methcillin (100 mg/kg/day). Therapy was continued for 1 month. After the tenth treatment day the fever left and the child rapidly improved. However, 3 months passed before the liver scan was normal. Shorter courses of therapy than used in these 2 patients are usually recommended. The schedule for the patients was based on their clinical course and the time the liver scan took to improve. Neither patient displayed any toxic effects.

1587 EFFECT OF HYCANTHONE ON VARIOUS DEVELOPMENTAL STAGES OF Schistosoma mansoni IN MICE. *(Fr.)* Lapierre, J.; Holler, C.; Lebas-Saison, E.; Le Prious, B.; Roose, A. (Cochin Hosp., Paris, France). *C.R. Soc. Biol. (Paris)* 168(4/5):452-455, 1974.

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See also, 1149, 1194, 1197.

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PRE-CLINICAL SCIENCES

MORPHOLOGY, CELLULAR STRUCTURE AND HISTOCHEMISTRY

598 THE EFFECT OF STARVATION AND REFEEDING ON CELL POPULATION KINETICS IN THE RAT SMALL BOWEL MUCOSA. *(E.)* Aldewach, H. S.; Wright, N. A.; Appleton, D. R.; Watson, A. J. (Dep. Pathol., Univ. Newcastle upon Tyne, England). *J. Anat.* 119(1):105-121, 1975.

The effects of starvation and refeeding on the proliferative indices, growth fraction, and cell cycle time in the rat small bowel were studied. Three-month-old male Wistar rats were starved continuously for 96 hours then allowed free access to food for -48 hr. Some animals were injected with vincristine before refeeding and all were injected with tritiated thymidine (0.5 μCi/g) 1 hr before death. Morphometric parameters, proliferative and/or labeling indices, and cell cycle parameters were measured in axially sectioned crypts from each animal. The crypt cell population showed a small reduction during starvation. The growth fraction remained constant but the total number of proliferating cells/crypt fell as a consequence of the reduction in crypt population. Both labeling and mitotic indices fell throughout the starvation period. Cell cycle time, measured by a stathmokinetic technique using vincristine, increased from 10.4 hr in control rats to 14.7 hr after starvation. Upon refeeding, the proliferative indices rose, while, after a small initial fluctuation, the growth fraction remained constant. The crypt population remained substantially unchanged and 16 hr after refeeding, the cell cycle time was reduced to 6.5 hr. The data indicate that the hypoproliferative response to starvation is mediated solely by an increase in cell cycle time, and the response to refeeding is interpreted in terms of a reduction in the cell cycle time. Changes in the size of the proliferating population do not appear to play an important role in either response, although it is not possible to entirely exclude the presence of resting cells in the proliferative compartment itself.

599 GRANULE RELEASE FROM ENDOCRINE CELLS IN ACIDIFIED HUMAN DUODENAL BULB: AN ELECTRON MICROSCOPE STUDY OF BIOPSY MATERIALS. *(E.)* Osaka, M.; Sasagawa, T.; Fujita, T. (Niigata Univ. Sch. Med., Japan). *Arch. Histol. Jpn.* 37(1):73-94, 1974.

A study was made of the types, fine structure, and distribution of endocrine elements in the human duodenal bulb and the responses of the cells to dilute HCl in order to identify those cells producing anti-acidic hormones. Biopsies (by duodenoscopy) of the mucosal tissue from the duodenal bulb of 6 patients were prepared for histological study. Four other patients had 40 ml of 0.1 N HCl infused into the duodenal bulb, then biopsies were taken after 5 min. Immunofluorescence techniques were used to identify hormones with gastroenteric endocrine cells. A greater number of endocrine cells were found in the duodenal bulb than in the lower part of the duodenum; 9 types were identified by their fine structures. Following acidification (pH 1.5) of the duodenal bulb, granule release by emiocytosis was observed under the electron microscope in 4 of the types. The granules appeared in pairs enclosed in a dumbbell-shaped invagination of plasma membrane of the gastroenteric endocrine cell. The granule release was considered a sign of accelerated release of secretory granules. The hormones produced by D, D_1, L and M cell types were proposed to be anti-acidic agents such as secretin, enterogastrone, cholecystokinin-pancreozymin and enteroglucagon, and the are assumed to be of great significance in the homeostatic control of the secretory activities of the gut (including liver and pancreas) caused by the ingestion of food.

1600 MEMBRANE UNBOUND CRYSTALS IN PANCREATIC ACINAR CELLS OF THE MOUSE. *(E.)* Machino, M.; Hoshino, K. (Fac. Med., Univ. Manitoba, Winnipeg, Canada). *Virchows Arch.* [*Zellpathol.*] 17(3):261-267, 1975.

The intracytoplasmic crystals found in the pancreatic acinar cells of the mouse were studied by electron microscopy. Pancreatic sections were taken from 4-month-old male C57BL mice. The basal cytoplasmic areas of the acinar cells frequently contained elongated, conical, oblong, rectangular, or rhomboid shaped crystals in the interspaces of the rough endoplasmic reticulum. The crystals were less than 5 μm in length and more than 0.1 μm in thickness and exhibited low to moderated electron densities. These crystals were detected in at least 1 cell in each ultrathin section. A parallel pattern formed by dense lines and less dense interspaces was observed in different crystal matrices. The center-to-center distances between the dense lines measured 100-150 Å. The crystal surfaces were devoid of any limiting membrane so that the outer aspects of the attached ribosomes of the endoplasmic reticulum were in direct contact with the crystal. On occasions when the ribosomes of the endoplasmic reticulum or free ribosomes were in close proximity to, but not in contact with the crystals, the ribosomes were connected with the surface of the crystals by filaments of 50-100 Å in thickness. The terminal portions of these filaments merged into the homogeneous crystal matrix, the heterogeneous portions of the matrix being occupied by tangled filaments or ribosomes. There was no indication that the crystal materials originated from a membrane element of the rough endoplasmic reticulum, Golgi sacs, lysosomes, mitochondria, nuclei, or degenerative organelles. The crystals of the acinar cells may be composed partially or wholly of protein, which seems to have a very slow turnover rate.

1601 RECOVERY OF PANCREAS FROM MILD PUROMYCIN-INDUCED INJURY. A HISTOLOGIC AND ULTRASTRUCTURE STUDY IN RATS. *(E.)* Longnecker, D. S.; Crawford, B. G.; Nadler, D. J. (Dartmouth Med. Sch., Hanover, N.H.). *Arch. Pathol.* 99(1):5-10, 1975.

Light and electron microscopic studies were conducted to characterize pancreatic acinar cell recovery following treatment of male Wistar rats with puromycin (40 mg/kg/hr i.p. for 4 hr). Peak pancreatic cell damage occurred after 12-24 hr at which time electron microscopy showed numerous autophagic vacuoles and intracisternal granules in the cells. By 48 hr, these were largely cleared from surviving cells although the intracisternal granules persisted in isolated acinar cells as long as 144 hr. At 24 hr, there was debris in the acinar lumina and interstitial space. It is concluded that some acinar cells injured by puromycin may survive and be restored to normal structure; that surviving acinar cells can extrude autophagic vacuoles; and that necrotic acinar cells are replaced by regeneration following puromycin-induced injury in rats.

1602 FENESTRATED ENDOTHELIUM OF THE LIVER SINUSOIDS OF THE GUINEA PIG AS REVEALED BY SCANNING ELECTRON MICROSCOPY. *(E.)* Itoshima, T.; Kobayashi, T.; Shimada, Y.; Murakami, T. (Okayama Univ. Med. Sch., Japan). *Arch. Histol. Jpn.* 37(1): 15-24, 1974.

The endothelium of the liver sinusoids of the guinea pig was studied by scanning electron microscopy. Specimens were fixed with 2% glutaraldehyde by a perfusion technique and were treated with a revised tannin-osmium method which avoids coating of the specimen with metal. The endothelium contained numerous intracellular and some intercellular fenestrae, the size and distribution of which varied with the position within the lobule. Larger fenestrae (0.5-3.0 μ in diameter) occurred in the endothelium near the central veins. The fenestrae became smaller and fewer in number toward the periphery of the lobules, measuring less than 0.3 μ in diameter close to the distributing veins. In addition, groups of micropores formed sieves in the concavities among the reticular crests of the endothelial sheet. The nuclear swelling as well as the cytoplasmic crests possessed small pits which most likely represented pinocytotic invagination. In the periportal area, the sinusoidal wall was partially composed of cells, presumably Kupffer cells, which had processes extending into the lumen. Cells with long processes extending over microvilli of hepatic cells, which were thought to be the fat-storing cells of Ito, could be seen through the large fenestrae just below the endothelium. The larger fenestrae situated near the central veins may function to supply a relatively greater quantity of blood, and hence nutrients, to satisfy the metabolic demands of this area.

1603 HEPATIC FINE STRUCTURE IN YOUNG AND AGING RATS TREATED WITH OXANDROLONE: A MORPHOMETRIC STUDY. *(E.)* Schmucker, D. L.; Jones, A. L.; (San Francisco VA Hosp., Calif.). *J. Lipid Res.* 16(2):143-150, 1975.

Morphometric techniques were used to study the fine structural changes induced by oxandrolone in the livers of normolipidemic young rats and hyperlipidemic aging rats (retired breeders). Young adult and retired breeder male Sprague-Dawley rats were given oxandrolone (100 mg/kg/day) in corn-oil margarine for 21 days p.o., while control animals receive the vehicle alone. The animals were then fasted for 24 hr, and given another dose of the drug or vehicle 12 hr before killing. In the young rats, oxandrolone reduced (nonsignificantly) the unit volume of the extrahepatocyte space and increased the average hepatocyte unit volume by a similar amount. The mean cytoplasmic volume fraction was greater in the experimental than in the control livers; this was attributed to a greater volume fraction of cytoplasm in the parenchymal cells of the former. There were no significant changes in the volume densities of the mitochondria, microbodies, lysosomes, or dense bodies. After oxandrolone administration, the mean surface density of the smooth endoplasmic reticulum, rough endoplasmic reticulum, and Golgi apparatus increased by 35%, 25% and 19%, resp. In the retired breeders, oxandrolone did not significantly affect the volume densities of the extrahepatocyte space or hepatocytes, and an observed reduction in the mean volume fraction of the biliary space was not significant. The experimental liver cells appeared to contain less cytoplasm than the control cells. There was a significant change in the volume fraction of microbodies in the livers of oxandrolone-treated animals. Although the hepatocytes in the control retired breeders contained significantly less smooth endoplasmic reticulum than the young controls, oxandrolone increased the surface density of the smooth endoplasmic reticulum in the older animals to a level 68% above the control value; thus there was no significant difference in the surface densities between the young and aged animals. Oxandrolone also increased the surface density of the rough endoplasmic reticulum and Golgi apparatus by 21% and 41%, resp. The data suggest that the age-related fine structural changes are not the result of irreversible alterations in the genome or translation-transcription apparatus; they may represent secondary reactions to extrahepatic and/or endocrine metabolic changes.

1604 ULTRASTRUCTURE AND FUNCTION OF THE PAROTID GLAND IN NORMAL RATS. *(Rus.)* Tsoi, G. K.; Nechaeva, N. V.; Eletskii, Iu. K. (N. I. Pirogov 2nd Moscow Med. Inst., USSR). *Arkh. Anat. Gistol. Embriol* 67(7):69-74, 1974.

1605 DEVELOPMENT OF ENTEROCHROMAFFIN AND DOPAMINE CELLS IN THE GASTROINTESTINAL TRACT OF THE CALF. *(E.)* Ahonen, A.; Penttila, A. (Dep. Anat., Univ. Helsinki, Finland). *Experientia* 30(12):1460-1462, 1974.

1606 OBSERVATIONS ON THE SUBMUCOUS PLEXUS AND MUCOSAL ARTERIES OF THE DOG'S STOMACH AND FIRST PART OF THE DUODENUM. *(E.)* Piasecki, C. (R. Free Hosp. Sch. Med., London, England). *J. Anat.* 119(1):133-148, 1975.

1607 EFFECT OF PYRIDINE DISSOLVED IN WATER ON THE GASTRIC AND INTESTINAL MUCOSA OF EXPERIMENTAL ANIMALS. *(Rus.)* Kondratiuk, V. A. (Ternopol Med. Inst., USSR). *Gig. Sanit.* (11):87-88, 1974.

608 THE DISTRIBUTION OF WHITE BLOOD CELLS IN THE GASTRIC AND HEPATIC CAPILLARIES IN THE OURSE OF HYDROCORTISONE ADMINISTRATION. ELECTRON ICROSCOPIC STUDY. *(E.)* Dragomir, C. T.; Tomescu, .; Cotutiu, C.; Ungureanu, D. (Victor Babes Inst., ucharest, Rumania). *Arch. Roum. Pathol. Exp. Microiol.* 33(2):191-194, 1974.

609 ULTRASTRUCTURE OF ENDOCRINE CELLS IN THE HUMAN GASTRIC MUCOSA. *(Ger.)* Mitschke, . (Pathol. Inst., Univ. Hamburg, Germany). *Verh. tsch. Ges. Pathol.* 57:446, 1973.

610 THE EFFECTS OF PARA-CHLOROMECURIBENZENE SULFONATE UPON ULTRASTRUCTURE OF CANINE ASTRIC SURFACE CELLS. *(E.)* Zalewsky, C. A.; oody, F. G.; Simons, M. A. (Univ. Utah Med. Cent., alt Lake City). *Fed. Proc.* 34(3):453, 1975.

611 HEXAGONAL CRYSTALLINE BODIES OF IgA IN THE CYTOPLASM OF THE HEPATOCYTES. *(E.)* Bedar, B.; Bliazek, J.; Brodanova, M.; Hermansky, F.; metana, K. (Fac. Med., Charles Univ., Prague, Czechslovakia). *Pathol. Eur.* 9(3):193-198, 1974.

512 LIVER ULTRASTRUCTURE AND LIPID COMPOSITION OF LIVERS FROM OBESE HENS WITH HEMORRHAGIC IVERS. *(E.)* Wills, J. R.; Savage, J. E.; Tumbleon, M. E. (Sch. Vet. Med., Univ. Missouri, Columbia). ed. *Proc.* 34(3):933, 1975.

1613 MINOR COMPONENTS OF RAT LIVER RIBOSOMAL RNA AS POSSIBLE INTERMEDIATES IN THE DEGRADATION OF 28S RNA IN VIVO. EFFECTS OF PARTIAL HEPATECTOMY AND STARVATION ON THEIR RELATIVE AMOUNTS. *(E.)* Inoue, T.; Takagi, M.; Umemura, Y.; Yamaguchi, H. (Lab. Radiat. Genet., Fac. Agric., Univ. Tokyo, Japan). *Agric. Biol. Chem.* 38(12):2457-2464, 1974.

1614 THE LOCATION OF BILE ACIDS IN THE HEPATOCYTE. I. *(Ger.)* Leuschner, U.; Alfurayh, A.; Uhlmann, W.; Wildgrube, H. J.; Erb, W. (Cent. Intern. Med., Johann Wolfgang Goethe Univ., Frankfurt/Main, Germany). *Z. Gastroenterol.* 12(2):95-102, 1974.

1615 REGENERATION AND FUNCTIONAL RECOVERY OF CANINE INTESTINAL MUCOSA FOLLOWING INJURY CAUSED BY FORMALIN. *(E.)* Stamm, B.; Mirkovitch, V.; Winistorfer, B.; Robinson, J. W. L.; Ozzello, L. (Canton. Univ. Hosp., Lausanne, Switzerland). *Virchows Arch.* [*Zellpathol.*] 17(2):137-148, 1974.

See also, 1811, 1812, 1870, 2300.

ABSORPTION—EXCRETION—TRANSPORT

516 TRANSPORT OF H^+ AND OTHER ELECTROLYTES ACROSS ISOLATED GASTRIC MUCOSA OF THE ABBIT. *(E.)* Fromm, D.; Schwartz, J. H.; Quijano, . (Harvard Med. Sch., Boston, Mass.). *Am. J. Phyiol.* 228(1):166-171, 1975.

on transport and the relation between luminal acidiication and organic acid production, metabolic CO_2 roduction and transmural pH gradients was studied n isolated gastric fundic mucosa of New Zealand hite male rabbits. Both the luminal and serosal urfaces were bathed in a Ringer solution free of icarbonate and CO_2. Luminal acidification reulted primarily (at least 90%) from H^+ secretion ather than from organic acid accumulation (based n measurements of pyruvate and lactate), or from he accumulation of CO_2. The availability of O_2 nd endogenous substrate was a limiting factor for pontaneous acid secretion, while the endogenous roduction of CO_2 was not a limiting factor. The ifferential appearance of CO_2 on the luminal and erosal borders of the mucosa suggested that a fracion of metabolic CO_2 is hydroxylated in the cell. O_2 appeared on the serosal side at a greater rate han on the luminal side, and the difference approxmated the rate of luminal acidification. This is ost likely due to the cellular formation of bicaronate that preferentially diffuses across the serosal border. Lowering the luminal pH to 4.5 caused a significant decrease in luminal acidification, and at pH 3.0 acidification ceased. In addition to net H^+ secretion, there was also net Cl^- and net Na^+ secretion, while net K^+ secretion was negligible. It was suggested that since luminal changes in H^+ concentration affected the rate of acid secretion and serosal changes did not, the gradient produced by H^+ secretion probably occurs at the luminal border.

1617 MECHANISMS OF ACID DISPOSAL IN CANINE DUODENUM. *(E.)* Dorricott, N. J.; Fiddian-Green, R. G.; Silen, W. (Harvard Med. Sch., Boston, Mass.). *Am. J. Physiol.* 228(1):269-275, 1975.

The ability of the canine duodenum distal to the major pancreatic duct, and therefore free from pancreatic, biliary, and Brunner's gland secretions, to dispose of acid was studied. Particularly examined were the capacity and mechanisms of disposal and whether they are load or concentration dependent. Distal duodenal pouches chronically exteriorized from the intestinal stream (those studied between 1 week and 12 months postoperatively) were perfused in 7 conscious mongrel dogs by a constant-circulation technique using isosmolar solutions containing 60-120 mM

HCl. The rate of disappearance of hydrogen ions (H^+) and net ion movements were measured. In both experimental groups (3 hour experiments and 30 min experiments) there was a loss of H^+ from the perfusate accompanied by a gain of sodium, potassium, and chloride, together with an increase in volume and a decrease in osmolality. The acid loss from any single area of the duodenum is a function of the H^+ to which it is exposed. The H^+ lost by neutralization was separated from that lost by diffusion by calculations based on the assumption that the observed changes in osmolality were the result of neutralization by bicarbonate: 67% of the acid was lost by neutralization, the rest back-diffusing in a 1:1 exchange for diffusable sodium. The ability to dispose of acid was impaired in those pouches which were chronically exteriorized and repeatedly exposed to acid, due to decreased secretion of bicarbonate.

1618 DEMONSTRATION OF THE RAPID ACTION OF PURE CRYSTALLINE 1α-HYDROXY VITAMIN D_3 AND 1α,-25-DIHYDROXY VITAMIN D_3 ON INTESTINAL CALCIUM UPTAKE.

(E.) Toffolon, E. P.; Pechet, M. M.; Isselbacher, K. (Harvard Med. Sch., Boston, Mass.). *Proc. Nat. Acad. Sci. USA* 72(1):229-230, 1975.

The effects of crystalline 1α-hydroxy vitamin D_3 (1α-OH-D_3) and 1α,25-dihydroxy vitamin D_3 (1α,25-$(OH)_2$-D_3) on intestinal uptake of ^{45}Ca were studied in Sprague-Dawley rats (mothers and male pups). Everted duodenal gut sacs from rachitic rats were studied after the rats had received 0.1 μg of either 1α-OH-D_3 or 1α,25-$(OH)_2$-D_3 *via* the jugular vein. Peak ^{45}Ca uptake was observed 1 hr after administration and both crystalline analogs were of comparable potency. The rapid induction of intestinal calcium transport by the crystalline vitamin D_3 analogs suggests a direct effect on the intestinal mucosal membrane, but this has not been demonstrated *in vitro*.

1619 GALACTOSE TRANSPORT ACROSS THE SEROSAL BORDER OF RABBIT ILEUM AND ITS ROLE IN INTRACELLULAR ACCUMULATION.

(E.) Holman, G. D.; Naftalin, R. J (Dep. Physiol., Univ. Leicester, England). *Biochim. Biophys. Acta* 382(3):230-245, 1975.

To determine the role of the serosal border of the ileum in the transport and accumulation of sugar in the cell, unidirectional fluxes of D-galactose across the brush and serosal border of the rabbit ileum were determined using the method of Naftalin and Curran. With Ringer's solution (Na) = 75 mEq, the K_m for galactose influx across the brush-border was 5 mM; with 0.1 mM ouabain present, the K_m was 50 mM, but the V (2.0 μM/cm^2/hr) remained unaltered. The Michaelis parameters for galactose influx across the serosal border were K_m = 59 and V = 4.7 μM/cm^2/hr, and for efflux, K_m = 85 mM and V = 6.8 μM/cm^2/hr. 2-Deoxy-D-glucose and methyl β-D-glucopyranoside inhibited galactose entry exclusively at the serosal and mucosal borders, resp., while 3-O-methyl-D-glucose inhibited galactose influx at both borders. Ouabain (0.1 mM) increased the K_I of 3-O-methylglucose for the mucosal galactose transport system from 50-150 mM, while the K_I of 3-O-methylglucose for the serosal transport system (100 mM) was unaltered. The inhibition of mucosal galactose transport by ouabain or by competition with other sugars resulted in reciprocal increase in the exit permeability and a decrease in the entry permeability. The inhibition of serosal galactose transport resulted in inhibition of both the entry and exit permeability, particularly the former. There was a small degree of permeability asymmetry at the serosal border to galactose which was reduced by ouabain or removal of Na^+ from the Ringer. The uptake of ^{14}C-labeled galactose from the serosal solution into the tissue was also inhibited by the addition of ouabain or removal of Na^+. Thus, there appears to be a weak active transport system for galactose at the serosal border. The net transepithelial flux was sufficiently high and the serosal permeability to galactose sufficiently low to be consistent with the view that galactose is concentrated within the tissue fluid after convection across the mucosal border because it is reflected at the serosal boundary.

1620 ABSORPTION OF VITAMIN B_{12} IN RATS WITH JEJUNO-ILEAL TRANSPOSITION.

(E.) Gronqvist, B. (Univ. Hosp., Uppsala, Sweden). *Acta. Chir. Scand.* 140(8):637-642, 1974.

The propulsive motility of the small intestine and the uptake of vitamin B_{12} by the small intestinal wall were studied in rats 2 weeks after jejuno-ileal transposition. Sprague-Dawley rats were sham-operated (control) or subjected to jejuno-ileal transposition, in which the jejunum and ileum were interchanged so that the ileum was placed proximally and the jejunum distally in the continuity of the intestine. The propulsive motility of the gastrointestinal tract was measured in both groups before and after surgery by recording the distribution of catheter-introduced sodium chromate in the gastrointestinal tract. The distribution of vitamin B_{12} in the gastrointestinal tract was measured in the same way using vitamin B_{12} labeled with ^{57}Co. Postoperative weight gain in the transposed animals was somewhat less than in the sham-operated rats, while the positions of the anastomoses showed little variation between the two groups. The amount of vitamin B_{12} remaining in the stomach at the end of the experimental period (2 weeks postoperatively) showed no significant difference between the 2 groups, but the controls showed a significantly greater uptake of the vitamin in the small-intestinal wall and a significantly greater content of vitamin B_{12} in the solution used to flush the small intestine at the end of the experiment. The distribution of radioactive chromate and vitamin B_{12} were essentially similar, although vitamin B_{12} had a somewhat more proximal distribution than the corresponding chromate. The data indicate that in the rat a transposed ileal segment improves its capacity to take up vitamin B_{12} with time after the operation, i.e., that a functional normalization takes place.

1621 EFFECTS OF SODIUM TAUROCHENODEOXYCHOLATE AND SODIUM TAUROCHOLATE ON CHOLESTEROL ABSORPTION IN THE RAT.

(E.) Raicht, R. F.; Cohen, B. I.; Mosbach, E. H. (Manhattan VA Hosp., New York, N.Y.). *Gastroenterology* 67(6):1155-1161, 1974.

The effect of dietary sodium taurochenodeoxycholate and sodium taurocholate on cholesterol absorption was studied in male Sprague-Dawley rats which were fed a commercial diet to which was added 5% corn oil and small amounts of cholesterol. This diet contained 1.61 mg/g of cholesterol and 0.62 mg/g of β-sitosterol. The diet was supplemented with sodium taurocholate (0.5%) or sodium taurochenodeoxycholate (0.5%). The rats in each group had similar food intakes (27 g/day), similar fecal outputs (8 g/day), and gained similar amounts of weight (100 g). Taurochenodeoxycholate did not significantly alter plasma cholesterol concentration, but it did increase hepatic cholesterol content (control rats, 2.5 mg/g; taurochenodeoxycholate-fed rats, 4.5 mg/g). Taurocholate feeding significantly increased plasma cholesterol concentration (control rats, 86 mg/100 ml; taurocholate-fed rats, 114 mg/100 ml), as well as increasing liver cholesterol concentration (8.0 mg/g). The differential effect of taurocholate and taurochenodeoxycholate on cholesterol absorption has several implications. The fact that taurochenodeoxycholate does not increase cholesterol absorption suggests that this bile acid directly affects 3-hydroxy-3-methylglutaryl CoA reductase, the rate-limiting enzyme of cholesterol synthesis. It also suggests that hepatic cholesterol accumulation in taurochenodeoxycholate-fed rats may be due to a direct effect of the bile acid on hepatic cholesterol metabolism. The greater accumulation with taurocholate, however, is due, at least in part, to the increased absorption seen with this bile acid.

1622 SURFACE AREA, OXIDATION REDUCTION POTENTIALS, AND pH IN THE GASTROINTESTINAL TRACT OF CONVENTIONAL AND GNOTOBIOTIC BEAGLES. *(E.)* Stevens, N. C.; Heneghan, J. B. (Louisiana State Univ. Sch. Med., New Orleans). *Fed. Proc.* 34(3): 475, 1975.

1623 STUDIES ON THE METABOLIC FATE OF ^{32}P-LABELLED EMULSIFIER YN IN THE MOUSE, GUINEA-PIG AND FERRET. *(E.)* Phillips, J. C.; Gaunt, I. F.; Gangolli, S. D. (Br. Ind. Biol. Res. Assoc., Carshalton, England). *Food Cosmet. Toxicol.* 13(1): 23-30, 1975.

1624 INTERPRETATION OF TRANSIENT VOLTAGE RESPONSE OF EPITHELIAL TISSUES TO STEP CURRENTS. *(E.)* Sanders, S. S.; Rehm, W. S. (Univ. Alabama Med. Cent., Birmingham). *Fed. Proc.* 34(3): 286, 1975.

1625 EFFECTS OF BILE SALT ON ION TRANSPORT IN THE CANINE GASTRIC MUCOSA. *(E.)* Kuo, Y. J.; Shanbour, L. L. (Univ. Texas Med. Sch., Houston). *Fed. Proc.* 34(3):286, 1975.

1626 THE EFFECT OF AGE ON THE GASTROINTESTINAL ABSORPTION OF AMINO ACIDS AND PEPTIDES. *(E.)* Ludorf, J.; Gallo-Torres, H. E. (Roche Res. Cent., Nutley, N.J.). *Fed. Proc.* 34(3):453, 1975.

1627 EFFECT OF PHENOXAZINE COMPOUNDS ON AMINO ACIDS ACCUMULATION IN RAT SMALL INTESTINE. *(E.)* Nakamura, Y.; Shibata, K.; Asai, W.; Minoura, H.; Nagata, Y. (Lab. Biochem., Fac. Agric., Gifu Univ., Naka Kagamigahara, Japan). *Agric. Biol. Chem.* 39(1):113-117, 1975.

1628 INTESTINAL ABSORPTION OF TETRAHYDROBIOPTERIN AND PTEROIC ACID IN MAN: A COMPARISON OF MODELS FOR THE TRANSPORT OF FOLATES ACROSS THE SMALL INTESTINE. *(E.)* Blair, J. A.; Ratanasthien, K.; Leeming, R. J. (Dep. Chem., Univ. Aston, Birmingham, England). *Gut* 15(10):832, 1974.

1629 D-AMINO ACID-INDUCED TRANSMURAL POTENTIAL CHANGES IN RAT SMALL INTESTINE. *(E.)* Nakamura, Y.; Yasumoto, K.; Sugiyama, K.; Mitsuda, H. (Fac. Agric., Kyoto Univ., Japan). *Agric. Biol. Chem.* 38(11):2149-2155, 1974.

1630 INFLUENCE OF DIETARY AMINO ACID COMPOSITION ON RATES OF INTESTINAL ABSORPTION. *(E.)* Herbert, J. D.; Coulson, R. A. (Louisiana State Univ. Med. Cent., New Orleans). *Fed. Proc.* 34(3):916, 1975.

1631 THE EFFECT OF SUCROSE FEEDING ON INTESTINAL TRANSPORT OF VARIOUS SUGARS IN TWO RAT STRAINS. *(E.)* Hallfrisch, J.; Reiser, S.; Michaelis, IV, O. E.; Putney, J. (U.S. Dep. Agric. Nutr. Cent., Beltsville, Md.). *Fed. Proc.* 34(3):910, 1975.

1632 GLUCOSE TRANSPORT ACROSS THE SMALL INTESTINE OF PARENTERALLY NOURISHED RATS. *(E.)* Schanbacher, L. M.; Copeland, E. M.; Dudrick, S. J.; Johnson, L. R.; Castro, G. A. (Univ. Texas Med. Sch., Houston). *Fed. Proc.* 34(3):917, 1975.

1633 EFFECT OF ETHANOL (ETH) ON SODIUM DEPENDENT GLUCOSE (GL) TRANSPORT IN JEJUNUM. *(E.)* Beck, I. T.; Dinda, P. K.; Beck, M.; McElligott, T. F. (no affil.). *Fed. Proc.* 34(3):469, 1975.

1634 AN EFFECT OF SHORT CHAIN FATTY ACIDS ON TRANSEPITHELIAL PD OF RAT JEJUNUM. *(E.)* Baker, D.; Wall, Jr., M. J. (Univ. Texas Med. Branch, Galveston). *Fed. Proc.* 34(3):475, 1975.

1635 AN INFRADIAN ENTRAINMENT OF FAT AND PROTEIN ABSORPTION IN THE RAT. *(E.)* Squibb, Jr., R. E. (Dep. Food Sci., Rutgers Univ., New Brunswick, N.J.). *Fed. Proc.* 34(3):917, 1975.

1636 STUDIES OF ABSORPTION IN PROTEIN DEPLETION I. ABSORPTION OF NICOTINIC ACID, THIAMINE AND RIBOFLAVIN IN THE RAT. *(E.)* De Angelis, R.; Santi, G.; Rogano, R. N.; Vecchia, M. G. (Inst. Biomed. Sci., Sao Paulo Univ., Brazil). *Arq. Gastroenterol.* 11(4):223-228, 1974.

1637 THE EFFECT OF STRESS ON THE DIURNAL PATTERN OF INTESTINAL TRANSPORT OF ASCORBIC ACID IN THE GUINEA PIG. *(E.)* Litwornia, B. L. (no affil.). *Fed. Proc.* 34(3):917, 1975.

1638 VITAMIN D-DEPENDENT CALCIUM UPTAKE BY ISOLATED INTESTINAL CELLS. *(E.)* Freund, T. S.; Bronner, F. (Univ. Connecticut Health Cent., Farmington). *Fed. Proc.* 34(3):475, 1975.

1639 VITAMIN D_3-MEDIATED INTESTINAL CALCIUM ABSORPTIVE MECHANISM: REGULATION BY CYCLIC AMP AND CALCIUM. *(E.)* Corradino, R. A. (Dep. Phys. Biol., New York State Vet. Coll., Cornell Univ., Ithaca). *Fed. Proc.* 34(3):887, 1975.

1640 BASIC FEATURES OF THE VITAMIN D-DEPENDENT PHOSPHATE TRANSPORT BY CHICK JEJUNUM IN VITRO. *(E.)* Peterlik, M.; Wasserman, R. H. (Dep. Phys. Biol., Cornell Univ., Ithaca, N.Y.). *Fed. Proc.* 34(3):887, 1975.

1641 INTESTINAL CALCIUM AND SODIUM FLUXES IN CORTICOSTEROID-TREATED RATS. *(E.)* Adams, J. S.; Lukert, B. P. (Kansas Univ. Med. Cent., Kansas City). *Fed. Proc.* 34(3):917, 1975.

1642 EFFECT OF MAGNESIUM (Mg) ON RAT JEJUNAL SODIUM (Na) AND WATER (H_2O) TRANSPORT. *(E.)* DiBona, G. F.; Sawin, L. L. (Univ. Iowa Coll. Med., Iowa City). *Fed. Proc.* 34(3):469, 1975.

1643 THE EFFECT OF FRUSEMIDE ON SMALL-INTESTINAL ABSORPTION OF WATER AND ELECTROLYTES. *(E.)* Mackenzie, J. F.; Cochran, K. M.; Russell, R. I. (R. Infirm., Glasgow, Scotland). *Gut* 14(10):831, 1974.

1644 ION TRANSPORT CHARACTERISTICS OF HUMAN JEJUNAL AND ILEAL MUCOSA IN VITRO. *(E.)* Isaacs, P.; Turnberg, L. A. (Manchester R. Infirm., England). *Gut* 15(10):830-831, 1974.

1645 EFFECTS OF SALINE INFUSION ON THE INTENSITY OF INTESTINAL ABSORPTIVE PRESSURE IN THE RAT. *(E.)* Bresler, E. H.; O'Dell, R. M.; Nielsen, K. T.; Cazenavette, L. L. (VA Hosp., New Orleans, La.). *Fed. Proc.* 34(3):469, 1975.

1646 THE EFFECT OF PHARMACOLOGICAL DOSES OF PREDNISOLONE ON THE ABSORPTIVE AND DIGESTIVE FUNCTIONS OF THE RAT SMALL INTESTINE. *(E.)* Batt, R. M.; Peters, T. J. (R. Postgrad. Med. Sch., London, England). *J. Physiol. (Lond.)* 245(2):124P-125P, 1975.

1647 PARTIAL PURIFICATION AND PROPERTIES OF INTRINSIC FACTOR-BINDING RECEPTOR FROM GUINEA PIG ILEUM. *(E.)* Cotter, R.; Rothenberg, S. P. (New York Med. Coll., N.Y.). *Fed. Proc.* 34(3):475, 1975.

1648 POTASSIUM INFLUX ACROSS THE BASO-LATERAL MEMBRANES OF RABBIT ILEUM. *(E.)* Nellans, H. N.; Schultz, S. G. (Univ. Pittsburgh Sch. Med., Pa.). *Fed. Proc.* 34(3):285, 1975.

1649 ION TRANSPORT BY RABBIT COLON: EFFECT OF AMILORIDE. *(E.)* Frizzell, R. A.; Koch, M. J.; Cooper, D. H.; Schultz, S. G. (Univ. Pittsburgh Sch. Med., Pa.). *Fed. Proc.* 34(3):285, 1975.

1650 A STUDY OF ABSORPTION OF COMPOUNDS FROM THE RAT BILIARY TREE BY RETROGRADE INTRABILIARY INJECTION (RII). *(E.)* Peterson, R. E. (Med. Coll. Wisconsin, Milwaukee). *Fed. Proc.* 34(3):711, 1975.

1651 BILIARY EXCRETION OF IOPANOATE GLUCURONIDE IN RAT. *(E.)* Cooke, W. J.; Munck, L. (Univ. Massachusetts Med. Sch., Worcester). *Fed. Proc.* 34(3):711, 1975.

1652 HEPATIC TRANSMEMBRANE POTENTIALS IN HEMORRHAGIC SHOCK. *(E.)* Sayeed, M. M.; Adler, R.; D'Agrosa, L. S.; Chaudry, I. H.; Baue, A. E. (Jewish Hosp., St. Louis, Mo.). *Fed. Proc.* 34(3):379, 1975.

1653 DIMINISHED URINARY DIGOXIN (D) EXCRETION AFTER SALICYLAZOSULFAPYRIDINE (SASP). *(E.)* Juhl, R.; Summers, R. W.; Blaug, S.; Guillory, J. K. (Univ. Iowa Coll. Med., Iowa City). *Fed. Proc.* 34(3):916, 1975.

See also, 1615, 1766, 1781, 1830, 1832, 1840.

1654 THE EFFECT OF GLUCAGON AND THE COMBINED EFFECT OF GLUCAGON AND SECRETIN ON LOWER ESOPHAGEAL SPHINCTER PRESSURE IN MAN. *(E.)* Christiansen, J.; Borgeskov, S. (Bispebjerg Hosp., Copenhagen, Denmark). *Scand. J. Gastroenterol.* 9(7):615-618, 1974.

The effects of glucagon and glucagon plus secretin on resting and pentagastrin-induced lower esophageal sphincter pressure were studied in 15 healthy volunteers (5 females and 10 males, aged 20-28 yr). The registration of intraluminal pressures in the stomach, lower esophageal sphincter, and esophagus was obtained using 3 water-filled polyvinyl tubes connected to external transducers. Glucagon (20 µg/kg) was administered i.v. as a single 30-sec injection; pentagastrin (0.5 µg/kg/hr) was administered i.v. continuously throughout the study, beginning 45 min before the glucagon injection. Other subjects were given glucagon (20 µg/kg) and/or secretin (1 U/kg) i.v. as a single 30-sec injection. Pentagastrin caused a 29% increase in the mean resting lower esophageal sphincter pressure (17-19 mm Hg), while glucagon decreased the mean resting pressure by 58% and the mean pentagastrin-stimulated pressure by 50%. Secretin decreased the pentagastrin-stimulated sphincter pressure by 41%, and glucagon combined with secretin decreased it by 56%. Thus the effects of glucagon and secretin when combined were neither synergistic nor antagonistic. The data indicate that glucagon is a potent antagonist to the effect of gastrin on the lower esophageal sphincter; it is likely that this antagonism is competitive.

1655 RESTING PRESSURES IN THE LOWER ESOPHAGEAL SPHINCTER. *(E.)* Bloom, A. A.; Stekelman, M.; Varadee, R.; Carvajal, S.; Davidson, M. (Bronx-Lebanon Hosp. Cent., Bronx, N.Y.). *Am. J. Dig. Dis.* 19(12):1120-1123, 1974.

Interdeglutitive pressures of the lower esophageal sphincter were studied by nonpullthrough techniques in 36 untrained volunteers. With the subject fasting and recumbent, a tube assembly was passed p.o. so that at least 1 opening was in the lower esophageal sphincter. The stomach was perfused with 300 ml of 0.9 N saline or 300 ml of 0.1 N HCl without moving the tube assembly. The initial unstimulated sphincter pressures averaged 13.3 mm Hg above the pressures in the gastric fundus. In 30 subjects, a gradual and protracted fall in the baseline occurred beginning 2-15 min after entry into the sphincter; its magnitude averaged 12.8 mm Hg. Lower esophageal sphincter pressure could, but did not necessarily, decay uniformly throughout the entire length of the esophagus; decay in sphincter pressure was never accompanied by a rise in pressure at the adjacent gastric or esophageal orifices. Decay usually resulted in a basal pressure intermediate between the initial sphincter pressures and the gastrofundal pressure. Protracted decay did not correct itself spontaneously, but could be reversed by swallowing, movement of the assembly (as in a pullthrough procedure), or by infusion with NaCl solution. Perfusion of the fundus with HCl restored sphincter pressure in only 1 of 6 cases. The data indicate that under the conditions of this study, the lower esophageal sphincter does not present a continuous barrier of high pressure separating the stomach and esophagus; they also suggest a need to redefine the lower esophageal sphincter.

1656 INDEPENDENCE OF GASTRIN AND HISTAMINE RECEPTORS IN THE LOWER OESOPHAGEAL SPHINCTER OF THE MONKEY AND POSSUM. *(E.)* de Carle, D. J.; Glover, W. E. (Sch. Med., Univ. New South Wales, Australia). *J. Physiol. (Lond.)* 245(2):78P-79P, 1975.

The action of pentagastrin (6 µg/kg/hr continuous i.v. infusion or 0.5-5.0 µg/kg i.v. bolus) on lower esophageal sphincter pressure was studied in the monkey (*Macaca nemestrinas*) and the Australian brush-tailed opussum (*Trichosurus vulpecula*), two animals with sphincters resembling that of man both histologically and functionally. Pentagastrin alone by continuous infusion or bolus produced a 41-92% increase in lower esophageal sphincter pressure in opossums and a 113-197% increase in monkeys. Simultaneous infusion of metiamide (2.7-4.5 mg/kg/hr) and/or mepyramine (1.0-2.0 mg/kg/hr) had little or no effect on this. Histamine (5-50 µg/kg) caused a rapid dose-related fall in sphincter pressure in all but one of 10 animals. Although metiamide and mepyramine alone were ineffective in counteracting the histamine effect, both together almost abolished histamine-induced sphincter relaxation. Metiamide and mepyramine together, but not alone, also greatly reduced the histamine-induced fall in arterial blood pressure, indicating that both H_1- and H_2-receptors are involved in the depressor component of the arterial pressure response to histamine in both species. It is furthermore concluded that histamine and its receptors are not involved in the sphincteric response to pentagastrin. It is suggested that administration of H_2-receptor-antagonists to peptic ulcer patients should not cause reflux.

1657 GASTRIN PENTAPEPTIDE DECREASES CANINE GASTRIC TRANSMURAL PRESSURE. *(E.)* Wilbur, B. G.; Kelly, K. A. (Mayo Clin., Rochester, Minn.). *Gastroenterology* 67(6):1139-1142, 1974.

The mechanism by which gastrin slows the gastric emptying of liquids was studied. In 4 conscious, fasted female mongrel dogs, the transmural pressure of the stomach was measured continuously for 75 min, while 154 mM NaCl (0.8 ml/min) was infused i.v. In similar experiments using the same dogs, gastrin pentapeptide (0.1 µg/kg/min) was added to the NaCl infusion between the 15th and 45th min of infusion. In another set of experiments, a flaccid plastic bag inserted into the stomach was distended with 500 ml of a 5.0% aqueous solution of sodium diatrizoate; the position of the distended bag in the stomach was observed fluoroscopically during NaCl infusion and then during NaCl plus gastrin pentapeptide infusion. The mean gastric transmural pressure of about 11 cm H_2O changed little when NaCl alone was infused. The intragastric plastic bag used to distend the stomach occupied the gastric fundus and corpus, but not the antrum, in all 4 dogs. Within 2 min after the start of gastrin pentapeptide infusion, a decrease in the mean transmural pressure and in the amplitude of phasic changes in pressure occurred in each case. The mean pressure remained low throughout the infusion of gastrin pentapeptide and the phasic changes were nearly abolished. Both returned to normal values within 30 min of the cessation of gastrin pentapeptide infusion. The infusion of gastrin pentapeptide did not alter the position of the plastic bag in the stomach. Thus, gastrin pentapeptide decreased gastric transmural pressure in the stomach. The rapid onset of its action suggests that it acts directly on structures in the gastric wall, but it may act indirectly by stimulating the gastric secretion of HCl.

1658 SPIKE-FREE ACTIVATION MECHANISM IN SMOOTH MUSCLE OF GUINEA-PIG STOMACH. *(E.)* Golenhofen, K.; Wegner, H. (Physiol. Inst. Univ. Marburg, Germany). *Pfluegers Arch.* 354(1):29-37, 1975.

Electrical and mechanical activity of circular muscle strips of guinea-pig stomach were studied to determine whether a spike-free activation mechanism could play a role in normal activation of stomach smooth muscle. Circular strips of stomach muscular wall were excised from the distal corpus/proximal antrum region of 31 guinea-pigs and mounted in a perfused glass capillary; electrical activity was measured extracellularly by platinum wire electrodes and recorded simultaneously with mechanical activity. Krebs solution with and without verapamil was used as the perfusion medium. Spontaneous activity consisting of phasic contractions combined with spike potentials was augmented by acetylcholine ($5 \times 10^{-8} - 10^{-7}$ g/ml) and suppressed by verapamil ($5 \times 10^{-6} - 2 \times 10^{-5}$ M/liter). Acetylcholine applied 15 min after treatment with verapamil produced a spike-free tonic activation. Under normal conditions phasic contractions were superimposed on this tonic activation. The acetylcholine-induced activation, therefore, consisted of 2 different components, one of which could be selectively blocked by verapamil. Both components disappeared in calcium-free solution. In 5 additional experiments using *taenia coli* preparations, no spike-free tonic activation could be elicited with acetylcholine. It is concluded that 2 different calcium activation systems are responsible for 2 components of activation of stomach smooth muscle.

1659 VAGAL CONTROL OF GASTRIC ELECTRICAL CONTROL ACTIVITY AND MOTILITY. *(E.)* Sarna, S. K.; Daniel, E. E. (Div. Biomed. Eng., Univ. Alberta, Edmonton, Canada). *Gastroenterology* 68(2): 301-308, 1975.

The nerves of Latarjet and those going directly to the fundus and the body of the stomach were stimulated in dogs to determine the effect on gastric electrical control activity (ECA) and contractions. The lower limits of effective stimulation parameters were: pulse frequency 2 pulses/sec; pulse width 2 msec; pulse amplitude 0.3 ma or 5 V. Stimulation at or near the lower limits of stimulation parameters caused contractions with little effect on gastric ECA. At higher pulse repetition rates and amplitudes, vagal stimulation caused premature control potentials (PCP's), delayed control potentials (DCP's), and contractions throughout the electrically active region. The PCP's and DCP's in the antrum became phase-unlocked from those in the corpus. After 2 to 5 min of such vagal stimulation, PCP's and DCP's disappeared; gastric control waves became phase-locked at normal frequency and aborad phase lag. Contractions continued to occur. Atropine and hexamethonium blocked all effects of vagal stimulation. After gastric ECA became insensitive to vagal stimulation, PCP's could still be produced by intraarterial acetylcholine or dimethylphenylpiperazinium, or by an electrical stimulus applied to gastric muscle, and physostigmine could temporarily restore ECA sensitivity to vagal stimulation. The ECA-insensitive state to vagal stimulation represents depletion of acetylcholine at preganglionic sites. It is concluded that since stimulation of vagal branches to the fundus and proximal corpus did not cause contractions or disruption in ECA pattern, those branches do not supply cholinergic motor fibers to the electrically active region of the stomach.

1660 GASTROINTESTINAL TRANSIT ESTIMATED BY AN ISOTOPE CAPSULE. *(E.)* Kirwan, W. O.; Smith, A. N. (West. Gen. Hosp., Edinburgh, Scotland). *Scand. J. Gastroenterol.* 9(8):763-766, 1974.

The adequacy of an isotope-containing capsule to measure total gastrointestinal and colonic transit time was evaluated by comparing it to the use of radio-opaque markers. After the capsule of perspex, containing approximately 10 µCi I^{131}, was swallowed, its exact position was determined using a sodium iodide scintillation counter. The capsule transit time was compared with that of radio-opaque markers in normal subjects and in patients with diarrhea and constipation. Stools were collected until at least 80% of the radio-opaque markers as well as the isotope capsule were recovered. In 10 normal subjects the transit time was 23 hr; in 5 constipated patients it was 187 hr. There was delay at the splenic flexure and rectosigmoid in constipated subjects but only at the rectosigmoid in normals. A high degree of correlation was observed between the 2 methods in normal subjects and in those with constipation, but less in cases of diarrhea (transit time too rapid for accurate measurement). Transit time was accelerated by varying the specific gravity of the isotope capsule from 1.1 (approximate specific gravity of gastrointestinal contents) to 1.35 or to 0.93. The acceleration was attributed to the possible separation of the heavier or lighter capsule from the luminal contents and its moving closer to the bowel wall, thus being more effectively propelled and excreted. It is concluded that an isotope capsule is an accurate tool (as reliable as radio-opaque markers) to monitor total, colonic or regional transit times in normal or constipated individuals.

1661 DUODENAL CONTROL OF GASTRIC EMPTYING IN THE MILK-FED CALF. *(E.)* Bell, F. R.; Mostaghni,

K. (Dep. Med., R. Vet. Coll., London, England). *J. Physiol. (Lond.)* 245(2):387-407, 1975.

The mechanisms of gastric (abomasal) emptying were studied in milk fed calves with open duodenal re-entrant cannulas which received duodenal infusions of various substances. Such a preparation allows for simultaneous infusion of test substances into the duodenum and collection of effluent fluid from the abomasum without mixing of the two. Sodium bicarbonate (200-500 mOsm/liter) or sodium chloride (200-300 mOsm/liter) infusion induced rapid abomasal emptying of a standard water test meal. Sodium bicarbonate was the more effective agent at all concentrations tested. Potassium chloride (100-700 mOsm/liter), calcium chloride (100-800 mOsm/liter), glucose (100-1200 mOsm/liter) and HCl (10-60 mEq/liter) all inhibited gastric emptying. Although hypotonic ammonium chloride (100-200 mOsm/liter) stimulated gastric emptying, isotonic or hypertonic ammonium chloride as well as urea, lactose and acetic acid had little effect. Hypertonic solutions of all test substances inhibited gastric emptying to varying degrees following duodenal instillation. The inhibitory and stimulatory effects of the test substances were independent of the abomasal contents. These results support the previously published view that osmotic control of gastric emptying resides in osmoreceptors within the duodenum.

1662 GASTRIC EMPTYING AND SECRETION OF BILE ACIDS, CHOLESTEROL, AND PANCREATIC ENZYMES DURING DIGESTION. DUODENAL PERFUSION STUDIES IN HEALTHY SUBJECTS.

(E.) Brunner, H.; Northfield, T. C.; Hofmann, A. F.; Go, V. L. W.; Summerskill, W. H. J. (Mayo Clin., Rochester, Minn.). *Mayo Clin. Proc.* 49(11):851-860, 1974.

Hourly gastric emptying and secretion of bile acids, biliary cholesterol, and pancreatic enzymes were measured over a 12- or 24-hr period by a duodenal perfusion technique in 18 healthy persons receiving liquid test meals at 8:00 am, noon and 6:00 pm. Test meals varying in caloric content (20 cal/kg, low calorie; 30 cal/kg, medium calorie; and 40 cal/kg, high calorie) but identical in caloric distribution were infused into the stomach. Replicate studies established methodologic and biologic reproducibility. Gastric emptying, assessed by duodenal recovery of the meal marker, was exponential and related to meal size. Bile acid and pancreatic enzyme outputs were similar in amount with all meals during the day. At night, they decreased to basal levels more rapidly with the low calorie meal, as gastric emptying became complete. Total daily bile acid output was approximately 240 mM/kg for the low calorie meal and 420 mM/kg for the medium calorie and high calorie meals. Recycling of the bile acid pool averaged 4/day for the low calorie meal and 6/day for the high calorie meal. Daily cholesterol secretion, which correlated highly with bile acid secretion, was approximately 28 μM/kg for the low calorie meal and 42 μM/kg for medium calorie and high calorie meals. The type of the meal appeared to determine the duration of gastric emptying, which in turn influenced the duration of pancreatic and biliary secretions. A major determinant of total outputs in these studies may be a meal flow sufficiently great to evoke cholecystokinin-pancreozymin release from the small intestine.

1663 VOMITING: RADIOGRAPHIC AND OSCILLOGRAPHIC CORRELATES IN THE DECEREBRATE CAT.

(E.) McCarthy, L. E.; Borison, H. L.; Spiegel, P. K.; Friedlander, R. M. (Dartmouth Med. Sch., Hanover, N.H.). *Gastroenterology* 67(6):1126-1130, 1974.

The visceral events associated with the mechanics of vomiting were observed radiographically in order to establish direct temporal correlations. Vomiting was evoked in 7 decerebrated, unanesthetized cats by i.m. administration of alkavervin (Veriloid) (50-100 g/kg). A barium meal (50-100 ml) was provided by stomach tube. The sequence of responses was followed cineradiographically using an image intensifier and appropriate filming procedures. Thoracic and abdominal venous pressures and diaphragmatic EMG's were monitored and recorded. The vomiting mechanism could be divided into 2 separate processes: retching and expulsion. Retching was characterized by repeated negative thoracic pressure pulses accompanied by diaphragmatic EMG activity (rapid descent of the diaphragm with concomitant positive pressure pulses in the abdomen). Contrast material from stomach moved to and fro into a dilated esophagus. Expulsion immediately followed the last retch and was characterized by a reversal of the thoracic pressure from negative to positive, continuing diaphragmatic EMG activity, sustained herniation of the gastric cardia into the thorax, and sudden cephalad movement of the diaphragm. These observations support the concept that retching is a preparatory maneuver in which the inherent antireflex characteristics of the abdominal esophagus and cardia are abolished by respiratory mechanisms.

1664 TWO DESCENDING NERVE PATHWAYS ACTIVATED BY DISTENSION OF GUINEA-PIG SMALL INTESTINE.

(E.) Hirst, G. D. S.; Holman, M. E.; McKirdy, H. C. (Dep. Physiol., Monash Univ., Clayton, Australia). *J. Physiol. (Lond.)* 244(1):113-127, 1974.

The discharge of excitatory synaptic potentials produced in myenteric neurons by distension of an orally situated segment of intestine was studied. Intracellular recordings were made from myenteric neurons lying in a flap of plexus attached to the aboral end of a segment of mid-small intestine in the guinea pig. The preparations were bathed in modified Krebs solution containing atropine sulfate, tubocurarine chloride, or tetrodotoxin. Excitatory synaptic potential could be evoked in most neurons by distension of the attached intestinal segment; 2 distinct descending polysynaptic pathways could be activated in this way. Transient, short-latency (0.5 sec) discharges were recorded from neurons lying along 1 pathway, while the excitatory synaptic potentials from neurons on the other pathway were recorded intermittently during maintained distension with latencies of 2-11 sec. When intracellular recordings were made from circular muscle cells on the anal side, distension evoked a transient hyperpolarization after a latency of about 1 sec; this was followed by a more prolonged excitation of both circular and longitudinal muscles. It is suggested that 1 pathway is a descending inhibitory pathway, while the other is a descending excitatory pathway. Both pathways could be activated by brief or prolonged distension of the adjacent intestinal segment. There was a long latency before the onset of a synaptic discharge in the neurons on the excitatory pathways and the discharge of excitatory synaptic potentials persisted several sec after the stimulus had been removed. The descending inhibitory pathway may be 'gated' in some way; AH cells (cells in which action potentials are followed by prolonged afterhyperpolarization) may provide afferent input to this pathway and limit the firing of excitatory synaptic potentials along it. In the presence of a stimulus (e.g., a bolus), activation of the inhibitory pathway would cause hyperpolarization of the circular muscle layer; then, after a delay, interneurons and excitatory neurons influencing both the circular and longitudinal muscle would be discharged causing a wave of excitation to sweep in an aboral direction along the intestine. These sequences would recur along the intestine until the bolus had in some way been dissipated.

1665 ACTION OF SOME ANTISPASMODICS ON GASTROINTESTINAL MUSCLE. *(E.)* Benzi, G.; Arrigoni, E.; Panceri, P.; Villa, R. F.; D'Angelo, L.; Panzarasa, R.; Autelli, M.; Berte, F. (Dep. Pharmacol., Univ. Pavia, Italy). *Digestion* 11(1/2): 72-89, 1974.

1666 SLEEP AND ESOPHAGEAL MOTILITY. *(Ger.)* Stacher, G.; Fink, G. (1st Surg. Clin., Univ. Vienna, Austria). *Z. Gastroenterol.* 12(4): 251-256, 1974.

1667 LOWER-OESOPHAGEAL-SPHINCTER RELAXATION IS A MYTH. *(E.)* Sullivan, S. N. (Victoria Hosp., London, Canada). *Lancet* 2(7884):809-810, 1974.

1668 VAGAL MECHANORECEPTORS OF THE LOWER OESOPHAGEAL SPHINCTER AND OF THE PYLORIC SPHINCTER IN THE CAT. *(E.)* Bitar, K.; Mei, N.; Michelucci, M. H. (Inst. Neurophysiol. Psychophysiol., Marseille, France). *J. Physiol. (Lond.)* 245(2):103P-104P, 1975.

1669 TENSION RECEPTORS IN THE OESOPHAGUS AND STOMACH OF THE RAT. *(E.)* Clarke, G. D.; Davison, J. S. (Dep. Physiol., Univ. Dundee, Scotland). *J. Physiol. (Lond.)* 244(1):41P-42P, 1975.

1670 A METHOD OF DISPLAYING THE ELECTRICAL ACTIVITY OF CANINE GASTRIC MUSCULATURE. *(E.)* Levien, L. J. (Dep. Surg., Univ. Witwatersrand, Johannesburg, South Africa). *S. Afr. J. Surg.* 12(2):72, 1974.

1671 THE EFFECT OF METOCLOPRAMIDE ON THE GASTRIC EMPTYING OF WATER AND A SOLUTION OF 10% GLUCOSE. *(Sp.)* Rodrigo Gomez, J. M.; Alapont Raga, V.; Guix Garcia, J.; Aparisi Quereda, L.; Serra Desfilis, M. A.; Palao Esteve, J.; Garcia-Conde Gomez, F. J. (Fac. Med. Valencia, Spain). *Rev. Esp. Enferm. Apar. Dig.* 44(5):469-484, 1974.

1672 USE OF INTRAGASTRIC FRUCTOSE TOLERANCE TEST IN ASSESSMENT OF GASTRIC EMPTYING. *(E.)* Pettit, G. W.; Bostian, K. A.; Elwell, M. R. (USA Med. Res. Inst. Infect. Dis., Fort Detrick, Md.). *Fed. Proc.* 34(3):910, 1975.

1673 SYNAPTIC POTENTIALS RECORDED FROM SOME NEURONES OF THE SUBMUCOUS PLEXUS OF GUINEA-PIG INTESTINE. *(E.)* Hirst, G. D. S.; McKirdy, H. C. (Dep. Physiol., Monash Univ., Clayton, Australia). *J. Physiol. (Lond.)* 244(1):35P-36P, 1975.

1674 EFFECTS OF PAPAVERINE ON THE RABBIT ILEUM UNDER THE INFLUENCE OF ALTERED TEMPERATURE AND EXTRACELLULAR Ca^{2+}. *(E.)* Reinhardt, D.; Wagner, J.; Schumann, H. J. (Inst. Pharmacol., Univ. Essen, Germany). *Eur. J. Pharmacol.* 29(2):279-283, 1974.

1675 INTESTINAL SMOOTH MUSCLE RESPONSE TO CHRONIC OBSTRUCTION: POSSIBLE APPLICATIONS IN JEJUNOILEAL ATRESIA. *(E.)* Cloutier, R. (Univ. Laval Hosp. Cent., Quebec, Canada). *J. Pediatr. Surg.* 10(1):3-8, 1975.

1676 INTESTINAL MYOELECTRIC ACTIVITY IN RESPONSE TO CHOLERA. *(E.)* Mathias, J. R.; Carlson, G. M.; Dimarino, A. J.; Bertiger, G.; Cohen, S. (Dep. Med., Univ. Pennsylvania, Philadelphia). *Fed. Proc.* 34(3):423, 1975.

1677 EFFECT OF PENTAGASTRIN ON ELECTRICAL ACTIVITY OF THE SMALL INTESTINE. *(E.)* Weisbrodt, N. W.; Copeland, E. M.; Kearley, R. W.; Moore, E. P.; Johnson, L. R. (Univ. Texas Med. Sch., Houston). *Tex. Rep. Biol. Med.* 32(2):586, 1974.

1678 MOTILITY OF THE LARGE INTESTINE OF MICE WITH HEREDITARY MEGACOLON. *(E.)* Brann, L.; Wood, J. D. (Univ. Kansas Med. Cent., Kansas City). *Fed. Proc.* 34(3):423, 1975.

1679 A PHARMACOLOGICAL ANALYSIS OF THE INHIBITORY EFFECTS OF THE SYMPATHETIC NERVES ON THE RABBIT COLON. *(E.)* Gillespie, J. S.; Khoyi, M. A. (Dep. Pharmacol., Univ. Glasgow, Scotland). *J. Physiol. (Lond.)* 244(1):42P-43P, 1975.

1680 SACRAL PARASYMPATHETIC REFLEX PATHWAY TO THE LARGE INTESTINE OF THE CAT. *(E.)* Krier, J.; de Groat, W. C. (no affil.). *Fed. Proc.* 34(3):423, 1975.

1681 RESPONSES OF NEURONS IN THE INFERIOR MESENTERIC GANGLION TO REPETITIVE STIMULATION OF PREGANGLIONIC INPUTS. *(E.)* Weems, W. A.; Szurszewski, J. H. (Mayo Found., Rochester, Minn.). *Fed. Proc.* 34(3):423, 1975.

1682 HORMONAL CONTROL OF COLONIC MYOELECTRICAL ACTIVITY. THE EFFECT OF PENTAGASTRIN AND GLUCAGON. *(E.)* Taylor, I.; Smallwood, R.; Brown, B. H.; Duthie, H. L. (no affil.). *S. Afr. J. Surg.* 12(2):72, 1974.

1683 EFFECTS OF BILE ACIDS ON THE MOTILITY OF THE COLON. *(E.)* Kirwan, W. O.; Smith, A. N.; Mitchell, W. D.; Eastwood, M. A. (West. Gen. Hosp., Edinburgh, Scotland). *Gut* 15(10):828, 1974.

1684 THE CHARACTER OF THE CAPACITANCE VESSEL RESPONSES IN THE SPLEEN AND INTESTINE UNDER ELECTRICAL STIMULATION OF THE SYMPATHETIC FIBRES. *(E.)* Tkachenko, B. I.; Medvedeva, N. J.; Pozdnjakov, P. K. (Inst. Exp. Med., Leningrad, USSR). *Experientia* 30(12):1413-1414, 1974.

1685 FUNCTIONAL DESCRIPTION OF THE CANINE CHOLEDOCHODUODENAL FLUTTER VALVE. *(E.)* Kendall, F. M.; Innes, D. L.; Martin, J. S.; Tansy, M. F. (Temple Univ. Health Sci. Cent., Philadelphia). *Fed. Proc.* 34(3):422, 1975.

1686 CONTINUOUS POSITIVE-PRESSURE VENTILATION AND CHOLEDOCHODUODENAL FLOW RESISTANCE. *(E.)* Johnson, E. E.; Hedley-Whyte, J. (Harvard Med. Sch., Boston, Mass.). *Fed. Proc.* 34(3):394, 1975.

1687 NEUROHUMORAL MOTORICITY OF THE CANINE EXTRAMURAL COMMON BILE DUCT. *(E.)* Murphy, J. J.; Tansy, M. F. (Temple Univ. Health Sci. Cent., Philadelphia, Pa.). *Fed. Proc.* 34(3):422, 1975.

1688 PRESSURE-VOLUME CHARACTERISTICS OF THE GALLBLADDER. *(E.)* Ryan, J.; Cohen, S. (Hosp. Univ. Pennsylvania, Philadelphia). *Fed. Proc.* 34(3):422, 1975.

See also, 1924, 1925, 1926.

SECRETION AND METABOLISM

1689 ROLE OF CALCIUM AND CYCLIC NUCLEOTIDES IN α-AMYLASE RELEASE FROM SLICES OF RAT PAROTID: STUDIES WITH THE DIVALENT CATION IONOPHORE A-23187. *(E.)* Butcher, F. R. (no affil.). *Fed. Proc.* 34(3):453, 1975.

1690 STUDIES ON Ca^{2+}-STIMULATED ADENOSINE TRIPHOSPHATASE IN RAT SUBMANDIBULAR GLANDS: ITS DISTRIBUTION AND PROPERTIES. *(E.)* Furuyama, S.; Negishi, T.; Tobe, Y.; Takiguchi, H. (Nihon Univ. Sch. Dent., Matsudo, Japan). *J. Dent. Res.* 54(1): 32-40, 1975.

1691 UNEXPECTED β ADRENERGIC EFFECTS OF THE ANTI-TUMOR AGENT, CYCLOCYTIDINE, ON RAT SALIVARY GLANDS. *(E.)* Schneyer, C. A.; Galbraith, W. M.; Mellett, L. B. (Univ. Alabama Med. Cent., Birmingham). *Fed. Proc.* 34(3):453, 1975.

1692 STUDIES ON ENZYME SECRETION AND CYCLIC AMP IN THE SUBMAXILLARY GLAND AND PANCREAS. *(E.)* Bhoola, K. D.; Lemon, M. J. C. (Med. Sch., Bristol, England). *J. Physiol. (Lond.)* 245(2):121P-122P, 1975.

See also, 1604, 1662.

SECRETION AND METABOLISM

Stomach

1693 INHIBITION OF IN VITRO STIMULATED GASTRIC ACID SECRETION BY A HISTAMINE H_2-RECEPTOR ANTAGONIST, METIAMIDE. *(E.)* Wan, B. Y. C.; Assem, E. S. K.; Schild, H. O. (Dep. Pharmacol., Univ. Coll. London, England). *Eur. J. Pharmacol.* 29(1):83-88, 1974.

The effect of a specific histamine H_2-receptor antagonist, metiamide, on histamine- or pentagastrin-induced gastric acid secretion was studied in the isolated frog gastric mucosa and the isolated rat stomach. Histamine (10^{-5} M) treatment of the frog gastric mucosa increased acid secretion from control level (5.03 μEq $H^+/cm^2/30$ min) to 10.62 μEq $H^+/cm^2/30$ min; pentagastrin (4×10^{-6} M) treatment increased acid secretion to 11.14 μEq $H^+/cm^2/30$ min. Metiamide (10^{-4} M) administered together with histamine reduced the histamine effect by 1/2 (7.42 μEq $H^+/cm^2/30$ min); metiamide together with pentagastrin completely abolished the pentagastrin effect (5.31 μEq $H^+/cm^2/30$ min). Consistent and significant stimulation of acid secretion by histamine and pentagastrin could be obtained in isolated rat stomach providing the preparations were selected for low basal secretion rates (less than 6 μEq $H^+/cm^2/30$ min), and the concentrations of stimulants be within their effective range (12-50 μg histamine/ml or 0.2-1.0 μg pentagastrin/ml). Metiamide (10 μg/ml) produced significant inhibition of stimulation at all concentrations of histamine and a persistent inhibition (up to 4 hr) of pentagastrin stimulation. These results suggest that the H_2-receptor antagonist, metiamide, acts directly on the acid secretory mechanisms of the gastric mucosa, although these *in vitro* findings do not rule out additional *in vivo* effects such as alterations in gastric mucosal blood flow.

1694 EFFECT OF BURIMAMIDE AND METIAMIDE ON PENTAGASTRIN-STIMULATED GASTRIC ACID SECRETION AND GASTRIC MUCOSAL BLOOD FLOW IN CATS. *(E.)* Albinus, M.; Sewing, K. F. (Dep. Pharmacol., Univ. Tubingen, Germany). *Experientia* 30(12):1435-1437, 1974.

The effects of 2 histamine-H_2-receptor-antagonists, burimamide and metiamide, on inhibition of pentagastrin-induced gastric acid secretion and gastric mucosal blood flow were compared in fasted, anesthetized male and female cats provided with acute gastric fistulas. Gastric secretory volume in response to pentagastrin (0.2 μg/kg/min i.v.) was characterized by a rapid rise to a maximum of 11 ml/30 min followed by a gradual decrease to 5 ml/30 min after 2 hr. Release of H^+ and Cl^- paralleled this pattern, reaching maxima of 145 mEq/liter and 170 mEq/liter, resp. Although burimamide (4 mg/kg i.v.) had no effect on any of these parameters, metiamide (2.9 mg/kg), when injected 60-90 min after the start of pentagastrin infusion, produced a significant decrease in gastric secretion (50%), acid secretion (56%) and mucosal blood flow (about 40%), but had no effect on Cl^- secretion. The failure of burimamide to have an effect is not in agreement with results of previous studies which utilized higher concentrations. The results with metiamide in which gastric secretion is inhibited to a greater extent than mucosal blood flow indicate that pentagastrin-induced secretion is more sensitive to H_2-receptor blockade.

1695 ELUCIDATION BY A H_2-RECEPTOR ANTAGONIST OF THE SIGNIFICANCE OF MUCOSAL HISTAMINE MOBILIZATION IN EXCITING ACID SECRETION. *(E.)* Lundell, L. Inst. Physiol., Univ. Lund, Sweden). *J. Physiol. (Lond.)* 244(2):365-383, 1974.

The effect of H_2-receptor blockade with metiamide on hormonal- or cholinergically-induced gastric acid secretion was studied in fasted female Sprague-Dawley rats with Heidenhain or Pavlov pouches with or without antral resection. Metiamide (4.9 mg/kg/hr i.v.) produced a 3-fold reduction in the maximum rate of gastric acid secretion (93.6 μEq/30 min) induced by pentagastrin (1 μg/hr i.v.), but had no effect on urinary histamine excretion (about 25 μg/hr). Mucosal histamine content was greater and formation was less in metiamide (9.7 mg/kg/hr) plus pentagastrin infused rats than in rats treated only with pentagastrin. Metiamide infusion also blocked methacholine-induced (10 μg/hr) acid secretion, acid secretion secondary to vagal stimulation with 2-deoxy-D-glucose (50 mg/kg with or without antral resection), and acid secretion occurring in response to feeding in animals with Pavlov pouches with or without antral resection. Metiamide had no effect on acid secretion in methacholine-treated animals also treated with pentagastrin, nor did it affect pepsin secretion in response to cholinergic stimulation. Metiamide (9.7 mg/kg/hr) inhibited the increase in gastric acid secretion in response to cholecystokinin-pancreozymin (1 μg/kg/hr) infusion. These results show that all stimuli known to mobilize histamine from gastric mucosa concurrently elicit acid secretory response which can be inhibited by H_2-receptor blockade. They also re-emphasize the importance of gastric mucosal histamine in stimulating parietal cell activity.

1696 HISTAMINE, PENTAGASTRIN, METHYL XANTHINES AND ADENYL CYCLASE ACTIVITY IN ACID SECRETION. *(E.)* Cooke, A. R.; Chvasta, T. E.; Granner, D. K. (Univ. Hosp., Univ. Iowa, Iowa City). *Proc. Soc. Exp. Biol. Med.* 147(3):674-678, 1974.

The possible role of pentagastrin in the stimulation of gastric acid secretion *via* cyclic AMP was tested by studying the *in vivo* effects of the methyl xanthines on acid output stimulated by histamine or pentagastrin in 16 male volunteers and in 4 dogs with gastric fistulas and Heidenhain pouches. The amounts of the substances infused in the dogs for 2 hr following determination of basal secretion levels were: caffeine (base) 10, 20, and 40 mg/kg/hr; aminophylline 5, 10, and 20 mg/kg/hr; pentagastrin 0.5, 1, 2, 4, and 8 μg/kg/hr, with or without caffeine, 10 mg/kg/hr; histamine dihydrochloride 0.0125, 0.025, 0.05, 0.1, 0.2, and 0.4 mg/kg/hr with or without caffeine 10 mg/kg/hr; and pentagastrin 1, 2, and 4 μg/kg/hr with 10 or 20 mg/kg/hr aminophylline. Gastric juice was collected from the gastric fistula and Heidenhain pouch every 15 min. Of the 16 human subjects (8 of whom were healthy students, and the rest suffering from either gastric or duodenal ulcer disease), 6 received caffeine in doses of 3 and 6 mg/kg/hr by i.v. infusion, the dose being doubled after 60 min. In another 5 subjects, 6 μg/kg/hr pentagastrin with or without caffeine (4 mg/kg/hr) was infused i.v. for 120 min; and in the last 5 subjects, histamine acid phosphate (0.04 mg/kg/hr) with or without caffeine (4 mg/kg/hr) was infused i.v. for 120 min. Gastric juice was collected at 10-min intervals. Pentagastrin-stimulated acid output was not increased by the methyl xanthines in dogs or man. Acid output in response to histamine was potentiated by caffeine in the dog but not in the human studies. Neither caffeine nor aminophylline when infused alone stimulated acid output in the dog. At the end of the animal experiments, studies were made *in vitro* of adenyl cyclase activity in fundic and antral mucosa. Adenyl cyclase activity in dog gastric mucosa was not stimulated by histamine or pentagastrin. Previous conflicting studies about the role of cyclic AMP in acid secretion are briefly discussed, and it is concluded that it is difficult to determine at present whether mammalian gastric secretion is related to, or independent of, changes in cyclic AMP.

1697 ACID SECRETORY RESPONSES TO HISTAMINE AND PENTAGASTRIN IN CONSCIOUS MONKEYS. *(E.)*

Rosato, E. F.; Mayer, L. J.; Arenschield, S.; Rosato, F. E.; Brooks, F. P. (Univ. Pennsylvania Sch. Med., Philadelphia). *Am. J. Dig. Dis.* 19(12):1111-1115, 1974.

Acid secretory responses to i.v. pentagastrin and histamine were studied in 8 male rhesus monkeys equipped with a gastric cannula and an indwelling polyvinyl catheter in the inferior vena cava which were chronically restrained in primate chairs. Histamine acid phosphate was infused i.v. at a constant rate of 30 ml/hr in doses of 0.02, 0.04, and 0.08 mg/kg/hr histamine acid phosphate. Pentagastrin was infused at a rate of 30 ml/hr in doses of 1.5, 7.5, and 15 μg/kg/hr. The animals were studied during 41 experiments for histamine and 43 for pentagastrin. The maximal acid response to histamine ranged from 2.57-8.39 mEq/hr and occurred within 15-25 min of the initiation of the histamine infusion. The maximal acid response to pentagastrin varied from 2.09-6.89 mEq/hr. For both stimulants the dose response curves were similar to those described for man with respect to sensitivity to stimulus, onset of acid response, and the response to supramaximal stimulation. The maximum acid response to histamine was significantly greater than the response to pentagastrin in 3 monkeys. The reason for this individual variation in response to the 2 stimulants is not known. There was no evidence of fade of acid secretory response at any dose level when analyzed for individual collection periods over a 45-min experiment. The lack of demonstrable secretory fade, however, does not rule out the presence of tachyphylaxis because of the technique of stepwise increase in pentagastrin dosage during single experiments. The use of this technique does not allow for accurate control of the blood levels of pentagastrin, and it is possible that accumulation of high levels of pentagastrin occurs in certain individuals. In 1 monkey, however, several tests were run where only the 7.5 and 15 μg/kg/hr pentagastrin doses were used and no difference in acid secretion was noted. Since both of these doses were supramaximal for this animal, it is concluded that tachyphylaxis was not responsible for the decreased acid response when compared with histamine in this monkey.

1698 INTERDIGESTIVE AND HISTAMINE-STIMULATED GASTRIC SECRETION IN GUINEA PIGS BEARING PERMANENT GASTRIC AND VASCULAR CANNULAS. *(E.)*

Kowalewski, K. (Surg. Med. Res. Inst., Univ. Alberta, Edmonton, Canada). *Digestion* 11(1/2):2-11, 1974.

Spontaneous interdigestive and histamine-stimulated gastric acid secretion were studied in fasted adult male guinea pigs supplied with permanent gastric and i.v. cannulas. Secretion with or without continous infusion of histamine (6.5-75 mg/kg/24 hr) was studied by collecting samples in 3, 3 and 18 hr fractions over a 24 hr period. Acid and pepsin secretion in unstimulated, as well as in animals infused with high doses (50-75 mg/kg/24 hr) of histamine, was highly variable, with some samples not containing detectable H^+. All samples, however, contained pepsin. In general, secretion volume, gastric acid output and concentration and pepsin secretion were higher than controls during the first 3 hr of histamine infusion with levels gradually decreasing thereafter. The maximally effective histamine dose which produced the greatest 24 hr output of acid (4.20 mg) and pepsin (212 mg) was 12.5 mg/kg/24 hr. This dose was about 8 times less than the maximally effective dose previously reported for rats. The fact that temporary achlorhydria has not been reported in rats suggests that vagal tonus may play a more important role in the interdigestive secretory phase in rats than in guinea pigs.

1699 ACID SECRETION AND MOBILIZATION OF GASTRIC MUCOSAL HISTAMINE ON COMBINED CHOLINERGIC AND PENTAGASTRIN STIMULATION. *(E.)*

Lundell, L. (Inst. Physiol., Univ. Lund, Sweden). *Agents Actions* 4(4):211-216, 1974.

Gastric secretion and histamine excretion were studied in an investigation of sites of interaction between cholinergic stimuli, pentagastrin, and gastric mucosal histamine. Sprague-Dawley rats were provided with Pavlov pouches in the oxyntic gland area, and were fasted 18 hr before each experiment. 2-Deoxyglucose (50 mg/kg), methacholine (10 μg/hr), or pentagastrin (0.0625-4 μg/hr) were administered i.v. Combinations were also used: pentagastrin (.0625-4 g/hr) plus 2-deoxyglucose (50 mg/kg); methacholine (10 g/hr) plus pentagastrin (8 g/hr); or methacholine (10 g/hr) plus histamine (1000 μg/hr). Gastric juice was collected by perfusion, and output determined, and the urine was assayed for histamine content. The vagal stimulant 2-deoxyglucose caused a rapid acid secretion rise to 92.5 μEq/30 min after 60 min, from an interdigestive level of 40.0 μEq/30 min. Histamine excretion was increased significantly from 12.5 μg/2 hr to 16.5 μg/2 hr. Even the lowest pentagastrin dose enhanced the effect of 2-deoxyglucose, and 0.25 μg/hr caused the maximal effect (337.4 μEq/2 hr), which was significantly higher than the effect of pentagastrin alone at 8 μg/hr (273.8 Eq/2 hr). A dose of 4 μg/hr of pentagastrin brought up histamine excretion to a maximum of 39.4 μg/2 hr. Methacholine alone caused no significant changes, but combined with pentagastrin (8 μg/hr), induced a secretion rate of 417 μEq/2 hr above interdigestive levels, significantly higher than that obtained from combined 2-deoxyglucose and pentagastrin stimulation (325.5 μEq/2 hr). The combined effect was not seen in histamine excretion. Methacholine and histamine combined caused a maximum secretion rate of 120 μEq/

30 min after 60 min. It is concluded that the vagal nerve has a facilitating influence on the parietal cell proper, rather than on the adjacent histamine-producing cells.

1700 THE EFFECT OF GRADED DOSES OF PENTAGASTRIN AND SECRETIN ON THE INTRINSIC FACTOR (IF) SECRETION IN MAN. *(E.)* Vatn, M. H.; Petersen, H.; Myren, J. (Ulleval Hosp., Oslo, Norway). *Scand. J. Gastroenterol.* 9(7):691-695, 1974.

The mode of intrinsic factor secretion was investigated using a wide dose range of pentagastrin and secretin in 3 series of experiments on healthy students of both sexes. In the 1st experiment, i.v. infusions of stepwise increasing doses of 0.078, 0.23, 0.7, and 2.1 U/kg/hr of secretin in physiologic saline solution were given at 37 ml/hr, each dose step lasting 30 min. In the 2nd experiment, i.v. infusions of stepwise increasing doses of 0.028, 0.167, 1.0, and 6.0 μg/kg/hr of pentagastrin in physiologic saline solution were given; and in the 3rd, i.v. infusions of 0.028, 0.167, 1.0, and 6.0 μg/kg/hr of pentagastrin were given on separate days with 1 week intervals to 5 individuals in randomized order. In experiment I, gastric and duodenal juice were collected by a Lagerlof tube in 10-min samples; in experiments II and III, 10-min samples of gastric juice were collected by a Levine tube. In experiment I, mean reflux of duodenal juice during stimulation in 9 examinations was 2.1 ml/30 min, range 0-12.25 ml. A reduction was found in the output of intrinsic factor, acid and volume of gastric juice by increasing doses of secretin. The output of pepsin was unchanged. No significant changes were found for concentrations of intrinsic factor and acid, whereas that of pepsin increased. In experiment II, a continuous 2-hr secretion of intrinsic factor on a high plateau level was demonstrated. An initial peak intrinsic factor output was observed on each dose level. The response was similar to that of pepsin, with a lower response to 6.0 than to 1.0 μg/kg/hr, in contrast to that of volume and acid. In experiment III, the responses to pentagastrin were higher after 6.0 μg/kg/hr for intrinsic factor and pepsin. Pepsin secretion continued on a high plateau level, compared to a low plateau level for intrinsic factor. It is suggested that the results support previous assumptions that secretion in the first 30 min contains preformed intrinsic factor. The increase of intrinsic factor secretion from basal to a low plateau level by even the smallest dose of pentagastrin may be the result of incomplete basal aspiration, continued secretion of preformed intrinsic factor, or stimulation of intrinsic factor synthesis. It is concluded that there is a dose-dependent secretion of intrinsic factor, pepsin, and acid to stimulation by 0.028 to 6.0 g/kg/hr of pentagastrin; the secretory mechanisms, however, appear to be different for the 3 substances.

1701 THE EFFECT OF CALCIUM AND PENTAGASTRIN ON THE GASTRIC SECRETION OF ACID, PEPSIN, AND INTRINSIC FACTOR (IF) IN MAN. *(E.)* Vatn, M. H.; Berstad, A.; Schrumpf, E. (Ulleval Hosp., Oslo, Norway). *Scand. J. Gastroenterol.* 9(7):697-701, 1974.

The effect of serum calcium on gastrin concentration, on acid, pepsin and intrinsic factor secretion, and on gastric secretion stimulated by different doses of pentagastrin was studied in 7 experiments carried out after an overnight fast in each of 5 healthy students of both sexes. Gastric secretion of acid, pepsin, and intrinsic factor, and serum gastrin concentrations were measured during i.v. infusions of calcium gluconate (4 mg Ca^{++}/kg/hr). No significant changes in serum gastrin concentrations were measured, in spite of an increase in mean serum calcium concentration from 9.7 to 11.8 mg/100 ml. The total outputs of pepsin and intrinsic factor increased significantly, whereas the increase of acid was not significant. Pentagastrin in doses of 0.1, 1.0, or 3.0 μg/kg/hr was given alone or combined with 4 mg/kg/hr Ca^{++} as calcium gluconate during 105 min. Calcium infusion significantly decreased acid secretion stimulated by the highest dose of pentagastrin. The intrinsic factor output stimulated by the lowest dose of pentagastrin was significantly increased by calcium. The increase of pepsin and intrinsic factor outputs is in agreement with the previously published concept of a stimulatory effect of calcium on macromolecular secretion. The results suggest that the effect of calcium on gastric secretion cannot be accounted for by changes in plasma gastrin concentration. There is no potentiation by calcium of pentagastrin-evoked secretion of acid, pepsin, or intrinsic factor, but a more complex interaction resulting in both stimulation and inhibition, depending on the dose of pentagastrin applied.

1702 FAILURE OF PENTAGASTRIN TO STIMULATE CYCLIC AMP ACCUMULATION IN HUMAN GASTRIC MUCOSA. *(E.)* Domschke, W.; Domschke, S.; Rosch, W.; Classen, M.; Demling, L. (Dep. Med., Univ. Erlangen-Nuremberg, Erlangen, Germany). *Scand. J. Gastroenterol.* 9(5): 467-471, 1974.

The effect of pentagastrin on the cyclic 3'5'-adenosine monophosphate (cyclic AMP) content of human gastric mucosa was studied in 21 healthy subjects. The cyclic AMP content of gastric mucosa, (measured by isotope dilution in mucosal biopsies taken from the corpus of the stomach during gastroscopy) did not change 30 min after pentagastrin administration (6 g/kg, s.c.), which is approximately the time of peak gastric acid output. Gastric acid secretion before and after pentagastrin administration did not correlate with cyclic AMP. In 2 patients with elevated serum gastrin and excessive basal hyperchlorhydria due to Zollinger-Ellison syndrome and insulinoma, resp., mucosal content of cyclic AMP was not different from the controls. However, previously reported compartmentalization of intracellular cyclic AMP, the hetereogeneity of biopsy material, and possible increased turnover rate of cyclic AMP in response to pentagastrin are factors which make the possible role of cyclic AMP in human gastric secretion unclear.

1703 DOSE-RESPONSE CURVE TO SECRETIN ON GASTRIC MUCUS SECRETION IN CONSCIOUS CATS. *(E.)* Vagne, M. (INSERM, Edouard Herriot Hosp., Lyon, France). *Digestion* 10(6):402-412, 1974.

The effect of secretin on gastric mucous secretion in the cat was studied to determine whether secretion was proportional to dosage, and whether its action persisted throughout an i.v. infusion. Three cats were given a Heidenhain pouch and a gastric fistula in the remaining part of the stomach, so that results could be evaluated with and without duodenal reflux. After an 18 hr fast, the gastric secretions from the gastric fistula, and the pouch were collected for 1 hr during a continuous i.v. infusion of 0.15 M saline at 13 ml/hr. Then secretin was added to the infusion at doses of 0.5, 3, and 18 U/kg/hr. For the first 2 dosages, collections were made after 3 hr periods; for the last, after one 2 hr period. Concentrations and outputs of pepsin, uronic acid, fucose, galactose, and total acid were determined. Determinations from the pouch indicated no change in acid output or concentration, while pepsin showed a significant increase at the dosages of 3 and 18 U/kg/hr. Fucose also showed a significant increase, as did the uronic acids and galactose, lasting throughout the infusion. Determinations from the fistula showed a decrease related to biliary reflux. Pepsin showed an increase at all doses, and the uronic acids were increased significantly. Fucose showed a weak increase due to bile reflux interference, and the galactose showed little change. The effects all lasted throughout infusion. It is concluded that the stimulant effect of secretin is proportional to the dose, and is greater on the polysaccharide than the glycoprotein fractions.

1704 INTERACTION OF DISULFIRAM AND ETHANOL ON GASTRIC MUCOSAL SECRETION AND BLOOD FLOW IN THE RAT. *(Fr.)* de Saint Blanquat, G.; Ozturkcan, O.; Derache, R. (Inst. Physiol., Paul Sabatier Univ., Toulouse, France). *Arch. Int. Pharmacodyn.* 208(2): 343-356, 1974.

Adult rats were given: (1) disulfiram (0-800 mg/kg) by gastric intubation; (2) ethanol (0.5 and 1 g/kg) by gastric intubation, and ethanol (0-4 g/kg) i.p.; and (3) both disulfiram and then ethanol, 2.5 hr later. In all cases, blood flow in the gastric mucosa was estimated by measuring the aminopyrine clearance along with the volume of secretion, free acidity, total acidity, and proteolytic activity. When the contents of the stomach were removed from rats treated with disulfiram alone, a whitish pellet of disulfiram was found; the mucosa appeared normal otherwise. After 2 hr, disulfiram significantly increased the volume, free acidity, total acidity, and proteolytic activity of the gastric juice, especially at moderate doses. The greatest increase in blood flow also occurred in these animals. There were significant positive correlations between blood flow and the secretory parameters. Administration of the larger dose of ethanol p.o. significantly increased the acidity, proteolytic activity, and blood flow above those in controls. There were also significant differences in the parameters for the 2 groups of controls, which differed only in the amount of liquid given. This result confirms the expectation that the direct action of alcohol on the gastric mucosa would distort the results. After i.p. administration of ethanol, there were significant deviations from control values in almost all cases, but not always in the same direction. There was a significant correlation between blood flow and secretion. Of the rats treated with both disulfiram and ethanol, all developed increased respiration and tachycardia less than 10 min after administration of ethanol; this lasted 20-30 min. The volume and proteolytic activity of the gastric juice did not change at all from control values; the free acidity and total acidity were consistently elevated; and blood flow increased following a large dose of disulfiram but was not affected by ethanol. There was a positive correlation between blood flow and volume and between free acidity and blood flow. The effects of ethanol on gastric secretion are consistent with those reported elsewhere for the rat and the dog. These findings indicate that the action of alcohol and disulfiram is neither cumulative nor antagonistic.

1705 DISSOCIATION OF GASTRIC ACID AND SERUM GASTRIN RESPONSES TO INTRALUMINAL CALCIUM IN MAN: INFLUENCE OF CALCITONIN AND PARATHYROID HORMONE. *(E.)* Holtermuller, K. H.; Goldsmith, R. S.; Sizemore, G. W.; Go, V. L. W. (Mayo Clin., Rochester, Minn.). *Gastroenterology* 67(6):1101-1106, 1974.

The effect of intragastric calcium on gastric acid secretion and serum gastrin in 19 healthy volunteers was characterized using an intragastric perfusion technique and its alteration by parathyroid hormone or calcitonin was investigated. Intragastric calcium chloride perfusion (80 mM, 5 ml/min) caused a 3-fold increase in gastric acid output without a change in serum gastrin and serum calcium values. The acid response to intragastric calcium represented a mean of 31.0% of the maximal gastric secretory capacity as determined with betazole. This effect was suppressed by calcitonin, but not influenced by parathyroid hormone, without a change in serum gastrin and serum calcium values. The mean calcium recoveries in gastric aspirate, expressed as percentage of calcium infused, were similar in these 3 experiments: calcium perfusion alone, 90.5%; calcium perfusion plus i.v. infusion of parathyroid hormone, 95.3%; and calcium perfusion plus i.v. infusion of calcitonin, 96.3%. There was no significant difference in the hourly gastric output of acid after perfusion of calcium chloride at pH 3.0 or pH 6.0. Perfusion of calcium into the duodenum, in an amount calculated to be the maximum leaked through the pylorus during the intragastric perfusion studies (12 mM, pH 6.0), did not cause gastric hypersecretion and gastrin release. In radioimmunoassay studies, the serum immunoreactive parathyroid hormone was normal ($\leq$ 40 µl-Eq/ml) in all subjects; plasma calcitonin remained undetectable (<50 pg/ml). These findings suggest that calcium can cause gastric hypersecretion by a direct effect on the parietal cells independent of the systemic calcium effect on gastric acid secretion.

1706 RELEASE OF GASTRIN AND STIMULATION OF ACID SECRETION BY BOMBESIN IN DOG. *(E.)* Impicciatore, M.; Debas, H.; Walsh, J. H.; Grossman, M. I.; Bertaccini, G. (VA Wadsworth Hosp. Cent., Los Angeles, Calif.). *Rend. Gastroenterol.* 6(2):99-101, 1974.

The effect of bombesin on serum gastrin and on acid secretion in dogs was studied to confirm previous findings. Three dogs (20-25 kg) were prepared with vagally denervated antral pouches, gastric fistulas, and Heidenhain pouches; 3 other dogs (19-25 kg) were antrectomized, and prepared with gastric fistulas, and Heidenhain pouches. Acid concentration was measured by titrating 0.2 ml samples with 2 M NaOH to pH 7.0; serum gastrin concentrations measured by radioimmunoassay. An i.v. infusion of bombesin (0.5 μg/kg/hr) for 90 min, with the antral pouch irrigated with 0.1 M $NaHCO_3$, increased serum gastrin and acid secretion in gastric fistula (107% pentagastrin response) and Heidenhain pouch (84% pentagastrin response). The responses peaked near the end of the infusion. Release of gastrin was inhibited but not abolished by bathing the antral pouch with 0.1 M HCl or by pretreating with atropine sulfate (0.2 mg/kg, s.c.). In antrectomized dogs, bombesin (1 μg/kg/hr) caused less than 1/10 gastrin release and acid secretion as in dogs with antrum. The acid response to bombesin was compared to the maximal response to pentagastrin and found similar. It is concluded that the mechanism by which bombesin stimulates acid secretion is by release of gastrin, mainly from the antrum, confirming previous studies.

1707 GASTRIN RELEASE BY BOMBESIN IN THE ANTRAL POUCH DOG. *(E.)* Basso, N.; Improta, G.; Melchiorri, P.; Sopranzi, N. (Dep. Surg. Pathol. III, Univ. Rome, Italy). *Rend. Gastroenterol.* 6(2):95-98, 1974.

Gastrin release by bombesin was studied in dogs provided with Heidenhain pouches, gastric fistulas, and innervated and denervated antral pouches. Each experiment was performed 4 times on each of 4 dogs, and blood samples (5 ml) were taken at 15 min intervals following infusion for determination of plasma gastrin. A control i.v. infusion of 0.15 M NaCl (60 ml/hr for 150 min) in dogs with an innervated antral pouch at pH 7.0 produced a consistent basal acid secretion in the Heidenhain pouch (60 μEq/15 min) and main stomach (1,000 μEq/15 min) and basal levels of immunoreactive plasma gastrin of 90 pg/ml. Acidifying the antral pouch (pH 1.0) lowered acid secretion (30 μEq/15 min) and plasma gastrin (39 pg/ml) in the Heidenhain pouch, but did not affect the stomach. Following antral denervation no acid secretion was observed in basal conditions in the stomach or Heidenhain pouch. Basal plasma gastrin was significantly lower (34 pg/ml). An insulin injection (1.6 U/kg) in dogs with innervated antral pouch produced a rise in stomach acid to a peak of 4,200 μEq/15 min. Plasma gastrin peaked at 130 pg/ml. After antral denervation insulin injection produced acid secretion from stomach, but no change in plasma gastrin. Bombesin infusion (1 μg/kg/hr) in dogs with innervated neutral antral pouch increased acid in stomach (3,800 μEq/15 min) and Heidenhain pouch (350 μEq/15 min); gastrin peaked at 280 pg/ml. Acidifying the antral pouch produced a significant but brief decrease in acid secretion and plasma gastrin followed by recovery. In dogs with denervated antral pouch, bombesin produced peak acid in stomach (2,600 μEq/15 min) and Heidenhain pouch (275 μEq/15 min) and peak gastrin of 250 pg/ml. The effect of acidifying the antral pouch was similar to that found in the innervated antral pouch. The authors conclude that gastrin is released from dog antrum following administration of bombesin, independent of vagal innervation, and bombesin appears to be the only stimulant to produce similar gastrin release from both innervated and denervated antral pouch.

1708 EFFECT OF SUPRAMAXIMAL DOSES OF STIMULI ON DEOXYRIBONUCLEIC ACID CONTENT OF GASTRIC ASPIRATE. *(E.)* Desai, H. G.; Venugopalan, K.; Antia, F. P. (B. Y. L. Nair Charitable Hosp., Bombay, India). *Indian J. Med. Res.* 62(9):1354-1359, 1974.

The DNA content of gastric juice was measured after maximal and supramaximal stimulation by pentagastrin and histamine. Normal control subjects, and subjects with duodenal ulcer and chronic gastritis had their stomach contents aspirated for 1 hr after a saline rinse, then 500 ml normal saline was injected into the stomach and aspirated. After basal values were thus determined, the process was repeated after s.c. injection of pentagastrin (300 or 450 μg) or histamine acid phosphate (2.4 or 3.2 mg). The antihistamine anthisan (50 mg, i.m.) was injected 1/2 hr before histamine injection. No significant increase in DNA was seen in 24 subjects after the lower dose of histamine, but the higher dose caused a significant increase of 5.5 ng atoms DNA-phosphorus (P)/min in 19. In 15 of the 19, a rise of DNA-P was observed. Of 12 subjects, the lower pentagastrin dose caused a barely significant increase of 3.6 ng atoms DNA-P/min. In 9 DNA-P was increased. The higher dose caused a significant rise of 4.8 in 14 subjects, in 11 of whom the DNA-P was increased. It is concluded that supramaximal doses of both pentagastrin and histamine significantly increase DNA content of gastric aspirate, indicating increased exfoliation of gastric surface epidermal cells.

1709 EFFECT OF p-CHLOROMERCURIBENZENE SULFONATE ON GASTRIC PARIETAL AND SURFACE CELL FUNCTION IN THE DOG. *(E.)* Moody, F. G.; Simons, M.; Jackson, T. (Univ. Utah Med. Cent., Salt Lake City). *Gastroenterology* 68(2):279-284, 1975.

Net ion and water movement across canine gastric secretory mucosa after exposure to *p*-chloromercuribenzene sulfonate, a sulfhydryl reagent which inhibits gastric acid secretion, was studied in mongrel dogs weighing about 15-20 kg. The dogs were anesthetized, and a segment of greater curvature of the stomach was excised and placed in a double lumen Lucite chamber. This provided 2 equal-sized mucosal compartments each with its own blood supply. Instillates were delivered into the hemichambers, recovered, analyzed for changes in volume, hydrogen, sodium and potassium, chloride, and protein. The 2 mucosal surfaces were used to compare ion and water fluxes in the presence and absence of *p*-chloromercuribenzene sulfonate (1-10 mM in mannitol). The reagent had a profound inhibitory effect on acid output after the gastric fundus had been stimulated by histamine phosphate, and this was accompanied by a large efflux of Na^+. When the reagent was applied on Tris-buffered mannitol there was less depression of H^+ output, while sodium efflux remained large, suggesting that back-diffusion had not been prevented by the buffer. There was no change in appearance during exposure of the resting mucosa to the reagent in mannitol with or without the buffer, but there was a gradual accumulation of mucus when the reagent was instilled in isosmotic acid. There was a small increase in protein output. *p*-Chloromercuribenzene sulfonate inhibited acid secretion in response to histamine by an effect on both parietal and surface cell function, resulting in both a decrease in H^+ production and an increase in hydrogen back-diffusion.

1710 APPEARANCE OF GASTRIN IN PERFUSATES FROM THE ISOLATED GASTRIC ANTRUM OF DOGS. *(E.)*

Andersson, S.; Nilsson, G. (Dep. Pharmacol., Karolinska Inst., Stockholm, Sweden). *Scand. J. Gastroenterol.* 9(7):619-621, 1974.

Three mongrel dogs were provided with Heidenhain pouches and fully innervated antral pouches in a study to determine whether the material with gastrin-like immunoreactivity in gastric juice is gastrin derived from the antrum mucosa and, if so, whether antral acidity might affect the outflow of antral gastrin into the gastric lumen. Gastric secretion was stimulated by perfusing the antral pouches with 15% ethanol solutions (100 ml/hr for 4 hr) at pH 7 or pH 1 or by a test meal consisting of 500 g of canned dog food with simultaneous perfusion of the antral pouches with buffer solutions at pH 7 or pH 1 (100 ml/hr for 3 hr). The ability of the antral perfusates to induce acid secretion was tested on Heidenhain pouch dogs during background stimulation with urecholine (0.5 mg/hr, i.v.). The presence of gastrin-like immunoreactivity in the antral perfusates was determined by radioimmunoassay. I.v. administration of extracts from the acid, but not from the neutral perfusates, evoked secretion from the gastric pouches. Gastrin-like immunoreactivity was present in both neutral and acid antral perfusates, but the concentrations and total amounts of gastrin-like activity were approximately 7 times higher in acid perfusates. The identical immunochemical behavior of the gastrin-like material and the pure porcine standard gastrin used in the immunoassay indicates that the immunoreactive material is gastrin, or is closely related to it. The relatively high concentrations of this material in perfusates from antral pouches lead to the conclusion that the major source of gastrin-like material in gastric juice may be the antrum mucosa. These results indicate that there is a "leakage" of gastrin-like activity into the antral lumen that is greatly increased at low pH's. It is suggested that this mechanism may be responsible for acid inhibition of gastrin release.

1711 RESISTANCE OF THE ANTRAL MUCOSA TO THE TROPHIC EFFECT OF GASTRIN IN THE DOG.

(E.) Willems, G.; Vansteenkiste, Y. (St. Peter's Hosp., Brussels, Belgium). *Biol. Gastroenterol. (Paris)* 7(3):237-240, 1974.

Purified porcine gastrin was administered i.v. to adult beagle dogs (13-17 kg) to study its trophic effect on antral mucosa. A nylon gastric cannula was inserted into each of 4 dogs to allow for serial biopsies to be taken of fundic and antral mucosa. Gastrin (4 μg/kg/hr) was infused for 4 hr and secretion collected every 15 min for volume and pH determination. Mucosal specimens (60 mm^2) taken at 4, 8 and 12 hr one day, and 16, 20 and 24 hr another day following a similar infusion, were prepared for histologic examination, then covered with autoradiographic emulsion. In the fundic glands, the labeling index (% of cells in DNA synthesis) increased to 250% of its control value by the 12th hr. The mitotic index increased from the 16th hr. There was no variation in controls. Antral specimens of the same animals showed an insignificant decrease in labeling and mitotic indices and no variations in controls. It is concluded that gastrin, at a dose which elicits all its known physiologic properties, has no trophic effect on the antral mucosa.

1712 RESPONSE OF THE ISOLATED PERFUSED STOMACH OF THE DOG TO ELECTRICAL VAGAL STIMULATION.

(E.) Lanciault, G.; Shaw, J. E.; Urquhart, J.; Adair, L. S.; Brooks, F. P. (Univ. Pennsylvania Sch. Med., Philadelphia). *Gastroenterology* 68(2):294-300, 1975.

The effect of vagal stimulation on immunoreactive gastrin release, gastric blood flow, and gastric acid output was studied in the isolated dog stomach. The isolated stomachs were perfused with the blood of an intact anesthetized dog at an input pressure of 100 mm Hg. The mucosal surface was perfused through an esophageal cannula with lactated Ringer's solution at 2 ml/min. Gastric contents were analyzed for acid secretion by titration, and arterial and venous blood were sampled regularly to determine gastrin concentrations. The left vagal trunk was stimulated with 7 V at 5 msec with the frequency varying from 0.5 to 10 Hz. Vagal stimulation at 5 Hz for 30 min was found to increase immunoreactive gastrin release and gastric blood flow significantly over control values by 88 pg/ml and 25 ml/min, resp. At 0.5, 2, or 10 Hz, immunoreactive gastrin concentrations were significantly elevated over controls, the greatest increase (4-fold) at 2 Hz. Gastric blood flow increased significantly only at 10 Hz, where it measured 70 ml/min. Gastric acid output was significantly increased at 0.5, 2 or 10 Hz (approximately 3.0-5.5 mEq/ml) over control values (which were negligible). It is concluded that isolated canine stomach responds to vagal stimulation with increase in gastric acid output, blood flow, and immunoreactive gastrin release.

1713 GASTRIC SECRETION AS A FUNCTION OF ACUTE AND CHRONIC STRESS IN THE GASTRIC FISTULA RAT.

(E.) Pare, W. P.; Isom, K. E. (VA Hosp., Perry Point, Md.). *J. Comp. Physiol. Psychol.* 88(1):431-435, 1975.

The effects of stress on gastric acid secretion were studied using gastric cannulas. Long-Evans rats (30) were cannulated and divided into 3 groups. The

1st group received grid electric shocks after a warning stimulus, and the 2nd without warning. Both received 6 shocks/hr randomly spaced. The 3rd group was a control and received no shock. Gastric samples were taken every 2 hr for 12 hr during the 1st day, as acute stress samples. The shock treatments were continued for 6 days, and on the last day, chronic stress samples were taken in the same manner. In a 2nd experiment, with 24 rats, baseline secretion samples were taken during a 10-day pre-stress period, each rat serving as its own control. In the 1st experiment, the rats given signalled shocks secreted significantly more gastric juice during chronic samples. In the 2nd experiment, gastric secretion was depressed for acute stress in the signaled shock group and total acid output for both groups (acute). Chronic stress caused an increase in both, but only the elevation of the total acid output from the unsignalled shock group was statistically significant. It is concluded that acute stress temporarily inhibits gastric secretion, but over a period of time the rats adapt to the stress and the values return to normal.

1714 RELEASE OF GASTRIC INHIBITOR FROM THE INTESTINE OF DOGS INFUSED INTRAVENOUSLY WITH SODIUM OLEATE. *(E.)* Kowalewski, K.; Secord, D. C. (Surg. Med. Res. Inst., Univ. Alberta, Edmonton, Canada). *Pharmacology* 12(3):177-185, 1974.

The ability of extracts of intestinal secretions or mucosa from sodium oleate-infused dogs to inhibit gastric secretion was studied in Labrador Retrievers with Heidenhain pouches. Dialyzed and lyophilized intestinal secretions or mucosal extracts collected from sodium oleate (0.02M, 10ml/hr) infused dogs over a 6 hr period were dissolved in glycine buffered 2 M urea (pH 9.5) and infused i.v. simultaneously with pentagastrin (6 μg/kg/hr) for 6 hr (20 mg/hr or 60 mg/hr). Extracts from saline-infused dogs served as controls. Intestinal secretion and mucosal extracts from oleate infused dogs inhibited gastric secretion by 62% and 47%, resp. Secretory extracts produced a 12% ($P < 0.01$) decrease in gastric H^+ concentration whereas mucosal extracts had no effect on this parameter. Infusion of sodium oleate had no effect on the composition of blood nor did it produce any changes in bile and pancreatic juice. Except for a slight decrease in liver cholesterol ($P < 0.05$), hepatic and pancreatic fatty acid composition was also not altered by oleate infusion. None of the dogs developed a febrile response, hypotension or vomiting during infusion of the extract, suggesting that the inhibition of gastric secretion in these animals was a specific effect. It is concluded that an enterogastrone-like inhibitor can be released in dogs by i.v. sodium oleate infusion as well as by intestinal fat instillation as has previously been shown.

1715 THE ROLE OF THE UPPER DUODENUM IN CONTROLLING GASTRIC ACID SECRETION IN THE RAT. *(E.)* Lundberg, B.; Andersson, S. (Dep. Pharmacol., Karolinska Inst., Stockholm, Sweden). *Scand. J. Gastroenterol.* 9(7):623-627, 1974.

The effects of 3 types of duodenal ligation on gastric secretory volume, acidity, acid output, and ulcer frequency in Sprague-Dawley rats were compared with that of pylorus ligation. The time between ligation and sacrifice varied between 3 and 16 hr. The 4 types of ligation used were: 1) ligature placed exactly at the pyloric sphincter; 2) ligature placed immediately proximal to the entrance of the common bile duct; 3) ligature around the duodenum half way between the pylorus and the bile duct; and 4) ligature placed so that the distance from the pylorus to the ligature was 1/4 of that from the pylorus to the entrance of the bile duct. There was no change in gastric juice volume 16 hr after ligation, whereas acidity and acid output were progressively reduced the further away from the pylorus the ligature was placed. Rats with duodenal ligatures had fewer and less severe ulceration compared with pylorus-ligated rats. With shorter periods of ligation (3 or 5 hr), duodenal ligation reduced both volume and acid output by about the same order of magnitude, independent of where the duodenal ligature was placed. The lowered acid output in rats with different duodenal ligations is probably the main reason for the smaller number of ulcers and perforations in comparison with pylorus-ligated groups. It is concluded that the upper duodenum of the rat contains a pH-sensitive gastric inhibitory mechanism.

1716 THE EFFECT OF A NEW BENZODIAZEPINE PSYCHOPHARMACEUTICAL AGENT, BROMAZEPAM, ON BASAL GASTRIC ACID SECRETION. *(Ger.)* Stacher, G. (1st Surg. Clin., Univ. Vienna, Austria). *Z. Gastroenterol* 12(3):179-184, 1974.

1717 EFFECT OF PROSTAGLANDIN ON GASTRIC SECRETORY FUNCTION. *(Pol.)* Swiderska-Kulikowa, B. (Acad. Med., Warsaw, Poland). *Pol. Arch. Med. Wewn.* 52(3):299-303, 1974.

1718 THE EFFECT OF SECRETAGOGUES AND ANTISECRETAGOGUES ON HISTIDINE DECARBOXYLASE ACTIVITY IN RAT GASTRIC MUCOSA. *(E.)* Oscarson, J.; Hakanson, R.; Liedberg, G. (Dep. Pharmacol., Univ. Lund, Sweden). *Agents Actions* 4(3):183-184, 1974.

1719 EFFECT OF ACIDIFICATION OF TOTALLY DENERVATED POUCHES OF THE DUODENAL BULB ON GASTRIC ACID SECRETION IN DOG. *(E.)* Nilsson, G. (Dep. Pharmacol., Karolinska Inst., Stockholm, Sweden). *Acta Physiol. Scand.* 92(4):569-571, 1974.

1720 THE INFLUENCE OF ACID AND BILE ON THE VIABILITY OF RABBIT MUCOSA. *(E.)* Fiddian-Green, R. G.; Silen, W. (no affil.) *S. Afr. J. Surg.* 12(2):69, 1974.

1721 ACID BASE BALANCE IN RELATION TO GASTRIC ACID SECRETION STIMULATED BY HISTAMINE AND PENTAGASTRIN IN CATS. *(E.)* Albinus, M.; Sewing, K. F. (Pharmacol. Inst., Univ. Tubingen, Germany). *Naunyn Schmiedebergs Arch. Pharmacol.* 285(4):325-335, 1974.

1722 THE EFFECT OF HISTAMINE-H_2-RECEPTOR-ANTAGONISTS ON GASTRIC ACID SECRETION, GASTRIC MUCOSAL BLOOD FLOW AND ACID BASE BALANCE IN CATS. *(E.)* Albinus, M.; Sewing, K. F. (Pharmacol. Inst., Univ. Tubingen, Germany). *Naunyn Schmiedebergs Arch. Pharmacol.* 285(4):337-353, 1974.

1723 EFFECT OF α- AND β-ADRENERGIC BLOCKING AGENTS ON THE DEVELOPMENT OF NEUROGENIC DYSTROPHY OF THE GASTRIC WALL AND ON GASTRIC CATECHOLAMINE CONTENT. *(Rus.)* Linich, E. P.; Zabrodin, D. N. (Inst. Exp. Med., Leningrad, USSR). *Farmakol. Toksikol.* 37:452-455, 1974.

1724 EFFECT OF ULCER-PROTECTING AGENTS ON THE FREE AMINO ACID CONTENT OF THE MUCOSA IN VARIOUS AREAS OF THE STOMACH IN EXPERIMENTAL NEUROGENIC DYSTROPHY. *(Rus.)* Mirzoian, S. A.; Tatevosian, A. T. (Erevan Med. Inst., USSR). *Zh. Eksp. Klin. Med.* 14(1):3-8, 1974.

1725 SENSING OF THE SECRETORY PROCESS BY A RECEPTOR APPARATUS IN THE GASTRIC MUCOSA. *(Rus.)* Bagaev, V. A.; Kurtsin, I. T.; Nozdrachev, A. D. (I. P. Pavlov Inst. Physiol., Leningrad, USSR). *Dokl. Akad. Nauk SSSR* 220(2):489-492, 1975.

1726 ACTION MECHANISM OF VEGETABLE JUICES ON PROPERTIES OF GASTRIC JUICE. *(Rus.)* Mukhin, I. M.; Zarembskii, R. A.; Mozzhukhin, A. S. (S. M. Kirov Mil. Med. Acad., Leningrad, USSR). *Fiziol. Zh. SSSR* 40(12):1891-1892, 1974.

1727 GASTRIN: SOME RECENT ASPECTS. *(Fr.)* de Graef, J.; Woussen-Colle, M. C.; Limbosch, J. M. (St. Pierre Univ. Hosp., Brussels, Belgium). *Acta Gastroenterol. Belg.* 37(6):247-258, 1974.

1728 OPT-REACTIVE CELLS AND GASTRIN CELLS IN THE DIGESTIVE TRACT OF THE CHICKEN. *(E.)* Sundler, F.; Larsson, L. I.; Hakanson, R.; Rehfeld, J.; Holst, J.; Stadil, F. (Dep. Histol., Univ. Lund, Sweden). *Agents Actions* 4(3):208-209, 1974.

1729 EXPERIMENTAL HYPERGASTRINAEMIA AND ANTRAL-GASTRIN-CELL HYPERPLASIA IN DOGS. *(E.)* Jennewein, H. M.; Ganguli, P. C.; Waldeck, F.; Siewert, R.; Polak, J. M.; Pearse, A. G. E. (Biol. Pharm. Res., C. H. Boehringer Sohn, Ingelheim/Rhine, Germany). *Gut* 15(10):835-836, 1974.

1730 IN VITRO BIOSYNTHESIS OF GASTRIC MUCOSAL MACROMOLECULES. *(Fr.)* Waldron-Edward, D.; Decaens, C.; Bader, J. P.; Robert, L. (Henri Mondor Hosp., Creteil, France). *C. R. Acad. Sci. [D] (Paris)* 279:1397-1399, 1974.

1731 PROTEIN SYNTHESIS AND SECRETION IN CULTURED RABBIT GASTRIC MUCOSAL BIOPSIES. *(E.)* Sutton, D. R.; Donaldson, R. M. (Nottingham Gen. Hosp., England). *Gut* 15(10):836, 1974.

1732 CONDIMENTS. *(E.)* Demling, L.; Koch, H. (Med. Clin., Univ. Erlangen-Nuremberg, Erlangen, Germany). *Acta Hepatogastroenterol. (Stuttg.)* 21(5):377-379, 1974.

See also, 1754, 2005, 2007.

SECRETION AND METABOLISM

Pancreas

1733 THE EFFECTS OF CHOLECYSTOKININ-PANCREOZYMIN, ACETYLCHOLINE AND SECRETIN ON THE MEMBRANE POTENTIALS OF MOUSE PANCREATIC CELLS IN VITRO. *(E.)* Greenwell, J. R. (Med. Sch., Univ. Newcastle upon Tyne, England). *Pfluegers Arch.* 353(2):159-170, 1975.

Cell membrane potentials in an *in vitro* preparation of pancreas from CBA mice of either sex were measured and the effects of cholecystokinin-pancreoxymin, acetylcholine, and secretin studied. The pancreas was placed in a tissue bath through which there was a flow of warmed superfusion fluid; the connective tissue sheath on the upper surface of the pancreas was removed by microdissection. The excised pancreas was allowed to equilibrate in the superfusion fluid for 20 min and the potentials recorded throughout the succeeding 3 hr. A microelectrode was advanced for distances up to 200 μ into the pancreatic tissue in areas over the duct system. The calibration pulse height and membrane potential deflection were fed into a computer which calculated the microelectrode resistance and the cell membrane potential, and printed out the membrane potential-frequency histogram. This histogram had 4 distinct peaks and was split into the sum of 4 Gaussian distributions with means of -14, -23, -32, and -41 (mV). The -32 mV peak was attributed to acinar cells which respond to cholecystokinin-pancreozymin (10^{-2} to 10^{-1} U/ml) or acetylcholine (10^{-7} to 10^{-5} M) by depolarizing to -15 to -20 mV, the response lasting up to 10 min. The -23 and -41 peaks were due to duct cells, which had a resting membrane potential of -23 mV and hyperpolarized to -41 mV in response to secretin stimulation. This response lasted for more than 15 min.

Duct cells, regardless of their position in the duct system, functioned electrophysiologically in identical fashion. It is concluded that the secretory sites for enzyme and electrolyte are distinct, the duct cells secreting only electrolyte and the acinar cells only enzyme.

1734 THE EFFECT OF AN INTRADUODENAL ELEMENTAL DIET ON PANCREATIC SECRETION.

(E.) Wolfe, B. M.; Keltner, R. M.; Kaminski, D. L. (Dep. Surg., St. Louis Univ., Mo.). *Surg. Gynecol. Obstet.* 140(2): 241-245, 1975.

The effect of an elemental diet on canine exocrine pancreatic secretion was evaluated by infusing an elemental diet into the duodenum and monitoring the output of the pancreas. Four dogs were prepared with pancreatic and chronic gastric fistulas. Perfusates used in these experiments were 0.15 M NaCl with an osmolality of 285 mOsm/liter, pH 6.9; 0-16 normal HCL in 0.15 M NaCl, osmolality of 290 mOsm/liter, pH 1.6; 127 mM L-phenylalanine with an osmolality of 300 mOsm/liter, pH 7.0. The elemental diet perfusate was prepared by diluting 80 g commercial vivonex 100 in 300 ml water to give a solution with a pH of 5.4 and a mean osmolality of 890 mOsm. The calculated amino acid concentration of the elemental diet infused was 155 mM/liter and that of the L-phenylalanine solution was 127 mM/liter, resulting in an amino load of 5.8 mOsm/15 min when the elemental diet was infused and 4.5 mOsm/15 min when the L-phenylalanine solution was infused. Cholecystokinin, when appropriate, was administered by continuous i.v. infusion, 2 U/kg/hr. Pancreatic secretions were collected and measured every 15 min. Pancreatic protein concentration was equated with pancreatic enzyme concentration and was determined by measuring fluorescence at 280 nm. Intraduodenal L-phenylalanine and elemental diet produced significant increases in pancreatic output and protein concentration when compared with control values. Both elemental diet and L-phenylalanine perfusion produced a pancreatic volume response not significantly different from that produced by cholecystokinin. The concentration of bicarbonate was significantly altered from control values by intraduodenal infusion of phenylalanine and elemental diet and i.v. administration of cholecystokinin. These findings suggest that the stimulatory properties of the elemental diet are primarily due to the amino acid content and that it stimulates the duodenal mucosa to secrete cholecystokinin which stimulates the exocrine pancreas. It is concluded that elemental diets administered in such a manner that the substance passes through the duodenum would not be a satisfactory method of providing calories to patients with acute pancreatitis.

1735 PANCREATIC ATROPHY AND OTHER PATHOLOGICAL CHANGES IN RATS FOLLOWING THE FEEDING OF STANNOUS CHLORIDE.

(E.) Dreef-Van der Meulen, H. C.; Feron, V. J.; Til, H. P. (Cent. Inst. Nutr. Food Res., Zeist, Netherlands). *Pathol. Eur.* 9(3):185-192, 1974.

The pathological effects of tin in rats were studied by feeding stannous chloride in levels just under those needed to produce growth retardation. Male and female weanling Wistar rats were maintained for 13 weeks on basal diets or basal diets containing stannous chloride; the dietary level of the tin compound was increased for 0.1-0.8% during the first 8 weeks, and held constant at 0.8% thereafter. None of the animals died during the experiment and none showed abnormal behavior. After the 4th week, the tin-fed males showed a reduction in weight gain and a lower food intake compared with the controls; no such changes were noted in the females. Hemoglobin levels in the blood were significantly decreased from week 6 in the males and from week 10 in the females. Mean cell volume, mean cell hemoglobin, and mean cell hemoglobin concentration were decreased in all tin-fed animals, the effect being greatest in the males. Alkaline phosphatase activities were decreased significantly in the females and nonsignificantly in the males. The relative weights of the kidneys, liver and adrenals were increased in both sexes and the weights of the heart, brain, testicles, and thyroid were increased in the males. The pancreas was often reduced in size and showed a wide spectrum of degenerative changes. The gastrointestinal tract in general showed gross evidence of irritation, and the small intestine underwent hypertrophic and hyperplastic changes in all tin-fed animals. Striking hepatic pallor occurred in 1 male, and enlarged hepatocytes and histological changes in the bile duct epithelium were noted in some males. Pancreatic atrophy appears to be the most specific morphological manifestation of the toxic action of stannous chloride in the doses given.

1736 PANCREATIC ENZYME SECRETION IN THE CONSCIOUS RAT. METHOD AND APPLICATION.

(E.) Hotz, J.; Zwicker, M.; Minne, H.; Ziegler, R. (Cent. Intern. Med., Univ. Ulm, Germany). *Pfleugers Arch.* 353(2):171-189, 1975.

A method developed for collecting duodenal juice and gastric content separately in conscious rats was used in secretory studies in the resting state and in response to cholinergic and hormonal stimuli, as well as under the influence of narcosis. Stainless steel cannulas were implanted into the stomach fundus of male albino Wistar rats and a double lumen tube inserted through the cannula *via* the pylorus into the duodenum. The 2 external openings of the gastric and duodenal tubes were connected to 2 collection vials. In the resting state (11 animals) there was a constant flow rate of duodenal volume, bicarbonate, trypsin, and amylase. Cholinergic stimuli (8 animals; carbachylcholine, 0.01 mg/100 g body weight) were capable of increasing enzyme secretion as much as 4-fold for 30-40 min when administered as a single s.c. injection. This effect was annulled by atropine (8 rats; 0.001 mg/100 g body weight). Secretin and cholecystokinin-pancreozymin (2.5 U/100 g body weight, each hormone) given together in a single injection s.c. or i.v. cause a similarly strong response (10 animals). The responses increased from 0.35 ml/20 min to a peak rate of 0.60 (s.c.) and from 0.42 to 0.65 (i.v.), resp. Identical ranges of the secretion maxima were found, with a tendency to decrease after the 1st hr, when the hormones were infused either s.c. or i.v. (49 animals). Doses from 0.5 to 25 U/100 g body weight/hr showed identical responses.

Doses below 0.2 U/100 g/hr were without effect. In 9 animals narcosis was initiated after a resting period of 1 hr by a single i.m. injection of 4 mg/100 g body weight phenobarbital. A marked depression of the resting secretion of volume and enzyme concentration by about 50% resulted. Secretin and cholecystokinin-pancreozymin, given by i.v. infusion (2.5 U/100 g body weight/hr, each hormone) caused a peak enzyme secretion rate which was significantly below the values of the animals tested in the conscious state. It is concluded that the method of the separate duodenal aspiration of the conscious rat seems to be suitable for examination of physiologic and pharmacologic effects on the resting and on the stimulated pancreatic enzyme secretion. Several tests can be performed on the same animal over a more than 3-week period, permitting the study of acute as well as chronic effects in the same animal.

1737 EFFECT OF EXPERIMENTAL HYPERTHYROIDISM ON PHOSPHOLIPASE A_2, LIPASE, CHOLINESTERASE, AND TRYPSIN ACTIVITIES IN THE PANCREATIC JUICE AND PANCREAS OF THE RAT. *(Fr.)* Belleville, J. (Fac. Sci. Mirande, Dijon, France). *J. Physiol. (Paris)* 68(1):65-74, 1974.

Hyperthyroidism was produced in Wistar rats by daily i.p. injection of thyroxine (50 μg/100 g) for 2 weeks. Pancreatic juices were obtained from 12 control and 9 hyperthyroid rats, and the pancreas was removed and analyzed from 14 control and 12 hyperthyroid rats. Protein content of the pancreatic juice and extract was determined by the Lowry colorimetric method, DNA content by the Dische method. Thyroxine injections produced decreased body weight and increased O_2 consumption. The hyperthyroid rats showed increased total pancreatic juice output, and the pancreatic juice had a higher specific activity of phospholipase A_2 and of trypsin, and higher content of these 2 enzymes and of cholesterolesterase; they also had a lower specific activity of cholesterolesterase and of lipase and lower lipase content. Hyperthyroidism produced greater weight of the pancreas, higher ratio of the pancreas to body weight, and, in the pancreas extract, increased total amount of protein, increased total amount of the 4 enzymes, increased total amount of DNA, significant increase in the specific activity relative to protein content for all enzymes except cholesterolesterase, and increased specific activity relative to DNA content for all 4 enzymes. It was concluded that thyroxine injections cause increased protein synthesis by the pancreas. The parallel increase in weight of the pancreas and amount of DNA suggests that there is an increase in the number of cells in the pancreas. It appears, judging from the case of lipase, that the excretion of pancreatic enzymes is not always proportional to the amount of enzyme in the pancreas.

1738 IN VITRO INTERACTIONS OF GASTROINTESTINAL HORMONES ON CYCLIC ADENOSINE 3'5'-MONOPHOSPHATE LEVELS AND AMYLASE OUTPUT IN THE RAT PANCREAS. *(E.)* Deschodt-Lanckman, M.; Robberecht, P.; De Neef, P.; Labrie, F.; Christophe, J. (Univ. Brussels Med. Sch., Belgium). *Gastroenterology* 68(2):318-325, 1975.

The effects of secretin, vasoactive intestinal polypeptide, pancreozymin (PZ), cerulein, C-terminal octapeptide of PZ (OC-PZ), and glucagon, singly and in combination, on cyclic AMP and amylase levels (per mg protein) in pancreas fragments from adult male Wistar rats are presented. Theophylline (10 mM) was added to the incubating solutions to amplify the cyclic AMP response. The 3-, 4-, and 5-fold increases in cyclic AMP levels observed 10 min after incubation with 10^{-7} M secretin, 10^{-6} M vasoactive intestinal polypeptide and 10^{-7} M secretin and 10^{-6} M vasoactive intestinal polypeptide, resp., were inhibited by 10^{-7} M PZ, cerulein, or OC-PZ (noncompetitive inhibition was suggested by the data but not proven). Significant amylase output, potentiated by secretin but not vasoactive intestinal polypeptide, was observed with 10^{-9} M PZ, cerulein, and OC-PZ. There was no correlation between amylase output and cyclic AMP levels. Copious amylase secretion was elicited even at control levels of cyclic AMP. Glucagon exerted no effect on either system. The data indicate that if an excess of cyclic AMP is necessary for amylase hypersecretion from acinar cells under physiological concentrations of pancreozymin, the action of this hormone must be limited to a small pool of cyclic AMP with a high turnover.

1739 EXOGENOUS AND ENDOGENOUS SECRETIN STIMULATION IN THE CONSCIOUS RAT. *(E.)* de Smul, A.; de Waele, B.; Wissocq, P.; Kiekens, R. (Lab. Exp. Surg., Vrije Univ., Brussels, Belgium). *Digestion* 11(1/2):39-50, 1974.

The effects of exogenous and endogenous secretin stimulation on the characteristics of pancreatic secretion were studied in male Wistar rats maintained in normal states of hydration and internal temperature. In the exogenous secretin experiments, secretin (1-8 U/kg) was injected i.v. at 3-hr intervals and the pancreatic juice collected in successive 10-min periods. In the endogenous secretin experiments, 0.1 N HCl or isotonic NaCl was infused in the duodenum at rates of 1-16 ml/hr, and samples of pancreatic juice were collected every 30 min. In the exogenous experiments, the mean basal secretion of pancreatic juice (8.85 μl/min) was significantly increased by secretin administration; higher doses of secretin prolonged the stimulatory effect. The mean basal bicarbonate concentration (20.0 mEq/liter) was moderately increased (compared with other species) by secretin administration, while the mean bicarbonate output (0.175 μEq/min) was increased even by low doses of secretin; higher doses prolonged the stimulatory effect. Secretin in high doses caused a drop in the protein concentration 10-20 min after administration; a significant increase in protein output occurred during the first 10 min after secretin injection. In the endogenous experiments, the volume of the pancreatic secretion rose moderately but significantly during infusion of 0.4, 0.8 and 1.6 mEq HCl/hr. The mean basal bicarbonate concentration increased slightly after HCl infusion, while the mean basal bicarbonate output rose significantly. The protein concentration decreased with HCl infusion and the protein output did not change. NaCl infusion caused no significant changes in volume, bicarbonate, or protein. The maximal secretory response to endogenous stimulation was less than after i.v. secretin injection, the rate of secretin release being the limiting factor in the endogenously stimulated secretin. It is concluded that postoperative basal pancreatic secretion is high in conscious rats, even when endogenous secretin stimulation induced by intraduodenal emptying of gastric acid is prevented by pylorus ligation. It is further concluded that the maximal response to secretin stimulation in rats is low in comparison with other species.

1740 STUDIES ON THE ELIMINATION OF SECRETIN AND CHOLECYSTOKININ WITH REGARD TO THE KINETICS OF EXOCRINE PANCREATIC SECRETION. *(E.)* Lehnert, P.; Stahlheber, H.; Forell, M. M.; Fullner, R.; Fruhauf, S.; Fritz, H.; Hutzel, M.; Werle, E. (2nd Med. Hosp., Univ. Munich, Austria). *Digestion* 11(1/2):51-63, 1974.

The extent of secretin and cholecytsokinin inactivation by the liver and kidneys and the kinetics of pancreatic secretion were studied in 72 fasted mongrel dogs. Under pentobarbital anesthesia, the pancreatic duct was drained ahead of the point where it opens into the duodenum, accessory pancreatic ducts were ligated, the common bile duct was drained, the pylorus was ligated, venesection was performed on both femoral veins, the renal artery was exposed, and polyethylene tubes were inserted into the portal vein and a pancreatic branch of the superior pancreatocoduodenal artery. On injection or infusion of secretin into the portal vein, the pancreatic volume and bicarbonate response were significantly smaller than following secretin administration through the femoral vein. But only when secretin was administered in doses of 0.25 U/kg/hr or less. No difference was observed in the secretion of pancreatic protein or enzyme after administration of cholecystokinin *via* the portal or femoral vein. Compared with femoral administration, biological activity in the pancreatic juice was reduced by 75 and 60% following administration of secretin and cholecystokinin, resp., through the renal artery. Ligature of the blood vessels of both kidneys resulted in an 80% increase in the biological activity of secretin and a 50% increase in the activity of cholecystokinin. The slopes of the flow rate curves after secretin injection were smaller after ligature of the renal blood vessels, and the biological half-life of secretin increased from 2.9-4.8 min. The data indicate that the kidneys play a role in the catabolism of exogenous secretin and cholecystokinin, while the blood and liver seem to play little part, at least with regard to cholecystokinin catabolism.

1741 INFLUENCE OF ORAL CONTRACEPTIVES ON THE RAT EXOCRINE PANCREAS: A HISTOLOGIC, HISTOCHEMICAL, AND ELECTRON MICROSCOPIC STUDY. *(E.)* Nizze, H. (Inst. Gen. Pathol., Univ. Rostock, Germany). *Exp. Pathol.* 9(5/6):311-316, 1974.

The influence of oral contraceptives (Ovosiston, Non-Ovlon, Sequenz-Ovosiston) on the secretion kinetics of the exocrine pancreas of rats was studied histologically, histochemically, and electron microscopically. Seventy-six Wistar rats of both sexes were divided into 4 groups: 20 given Ovosiston for 1, 3, 7, 14, 21 days; 20 given Non-Ovlon for same number of days; 24 given Sequenz-Ovosiston for 1, 3, 7, 14, 17, 19, 21 days; 12 given 0.2 g lactose for the same time periods and serving as controls. Each pill of Ovosiston contained 2.0 mg chlormadinon acetate for gestagen and 0.08 mg mestranol for estrogen; each pill of Non-Ovlon contained 1.0 mg norethisteron acetate for gestagen and 0.06 mg ethynylestradiol for estrogen; Sequenz-Ovosiston was simply 0.10 mg mestranol when given the first 14 days and then simply Ovosiston when given the next 7 days. Each rat received a single pill dissolved in physiological saline and administered by means of a throat probe. The dose averaged 400 times that given daily to an average woman for hormonal contraception, and was found to cause no damage in rat exocrine pancreas in experiments up to 21 days. Secretory activity of acinar cells decreased in female rats early in the experiments with Ovosiston and Non-Ovlon; it increased late in the tests with Ovosiston and Sequenz-Ovosiston. Ultrastructural changes (vesiculation of endoplasmic reticulum) following Sequenz-Ovosiston could not be correlated with histochemical findings which were heterogeneous. The alterations observed are interpreted as an adaptive reaction of the secretion mechanism of the exocrine pancreas to the hormonal contraceptives, and the author suggests further studies to determine whether those changes can turn to dystrophia.

1742 INHIBITION OF EXTERNAL PANCREATIC SECRETION BY EXTRACTS OF ILEAL AND COLONIC MUCOSA. *(E.)* Harper, A. A.; Hood, A. J. C.; Mushens, J.; Smy, J. R. (Sch. Pharm., Sunderland Polytech., England). *Gut* 15(10):825, 1974.

1743 INHIBITION OF PANCREATIC SECRETION BY CALCITONIN. *(E.)* Appert, H. E.; Nakashima, Y.; Howard, J. M. (Med. Coll. Ohio, Toledo). *Fed. Proc.* 34(3):454, 1975.

1744 INHIBITION OF PANCREATIC AMYLASE RELEASE IN-VITRO BY VINBLASTINE. *(E.)* Williams, J. A. (Dep. Physiol., Univ. California, San Francisco). *Fed. Proc.* 34(3):454, 1975.

1745 INCREASE IN PANCREATIC RNA SYNTHESIS FOLLOWING STIMULATION. *(E.)* Rajotte, D.; Morisset, J. (Gastrointest. Res. Unit, Fac. Sci., Sherbrooke Univ., Quebec, Canada). *Fed. Proc.* 34(3): 454, 1975.

1746 NEUROHORMONAL CONTROL OF PANCREATIC SECRETION. *(E.)* Konturek, S. J. (Med. Acad. Krakow, Poland). *Acta Gastroenterol. Belg.* 37(6): 273-282, 1974.

1747 THE EFFECT OF ACUTE ALCOHOL ADMINISTRATION ON EXOCRINE PANCREATIC SECRETION IN THE PIG. *(E.)* Wheatley, I. C.; Terblanche, J.; Hickman, R.; Barbezat, G. O. (Dep. Surg., Univ. Cape Town, South Africa). *S. Afr. J. Surg.* 12(2):71, 1974.

1748 PANCREATIC CHANGES INDUCED BY CHRONIC (TWO YEARS) ETHANOL TREATMENT IN THE DOG. *(E.)* Tiscornia, O. M.; Palasciano, G.; Sarles, H. (Dig. Pathol. Res. Unit, INSERM, Marseille, France). *Gut* 15(10):839, 1974.

1749 RESPONSE OF THE RAT PANCREAS TO INTESTINAL INFUSIONS OF PHENYLALANINE, TRYPTOPHAN, LYSINE OR CASEIN. *(E.)* Lyman, R. L.; Smith, L.; Chang, I. (Dep. Nutr. Sci., Univ. California, Berkeley). *Fed. Proc.* 34(3):917, 1975.

1750 EFFECT OF BILE OBSTRUCTION IN RATS ON PANCREATIC ENZYME SECRETION AND ON RECOVERY OF TRYPSIN AND CHYMOTRYPSIN FROM THE INTESTINE. *(E.)* Green, G. M.; Nasset, E. S. (Child. Hosp. Med. Cent., Oakland, Calif.). *Fed. Proc.* 34(3):394, 1975.

1751 HISTONE MODIFICATIONS IN THE RAT PANCREAS AFTER PARTIAL PANCREATECTOMY. *(E.)* Varricchio, F.; Mabogunje, O.; Fitzgerald, P. J. (Mem. Sloan-Kettering Cancer Cent., New York, N.Y.). *Fed. Proc.* 34(3):872, 1975.

1752 COMPARISON OF ENZYME SECRETION AND MORPHOLOGY IN THE RAT PANCREAS AFTER LIGATION OF THE PANCREATIC DUCT. *(Ger.)* Schmitz-Moormann, P.; Kirchner, R. (Pathol. Inst., Univ. Marburg, Germany). *Z. Gastroenterol.* 12(1):9-14, 1974.

See also, 1692, 1851, 1871, 2150.

SECRETION AND METABOLISM

Hepatobiliary Tract

1753 HEPATIC REGENERATION IN THE ABSENCE OF PORTAL VISCERA. *(E.)* Whittemore, A. D.; Kasuya, M.; Voorhees, Jr., A. B.; Price, Jr., J. B. (Coll. Physicians Surg., Columbia Univ., New York, N.Y.). *Surgery* 77(3):419-426, 1975.

To investigate the influence of portal factors on hepatic regeneration in the rat and to clarify the apparent regulatory role of glucagon, a rat preparation was developed which was totally devoid of portal viscera and thus deficient in all possible hepatotrophic substances of portal origin. Male Sprague-Dawley rats were subjected to sham surgery (placement of catheters in the superior vena cava and the common bile duct), hepatectomy, portacaval anastomosis with hepatectomy, evisceration with hepatectomy, or evisceration with hepatectomy followed by postoperative supplementation with glucagon (0.2 mg/kg/day). The animals were killed 24-96 hr postoperatively and and representative specimens from the hepatic remnant subjected to biochemical analysis. Although the hepatic glycogen concentrations were variable, the highest levels were attained within 24 hr prior to the maximum rate of DNA synthesis in all groups except those subjected to evisceration with hepatectomy. During the following 24 hr, the glycogen level decreased concurrently with the onset of maximal DNA synthetic activity. The peak DNA synthetic response in all groups was also associated with the peak synthesis of intracellular RNA; beyond the DNA synthetic peak, RNA decreased with a gradual increase in DNA. The sham-operated rats showed a significant increase in DNA synthesis at 48 hr postoperatively (specific activity, 18 x 10^{-3} disintegrations/min/mg), DNA synthesis peaked at 36 hr in the hepatectomized rats (395 x 10^{-3}), at 72 hr in the animals subjected to portacaval anastomosis with hepatectomy (365 x 10^{-3}) and at 96 hr in those subjected to evisceration with hepatectomy (173 x 10^{-3}). The eviscerated hepatectomized rats supplemented with glucagon showed a peak in DNA synthesis at 48 hr (318 x 10^{-3}) with a larger peak at 72 (428 x 10^{-3}); these values are significantly higher than those of the eviscerated-hepatectomized rats (26 x 10^{-3} and 92 x 10^{-3} at 48 and 72 hr, resp.). The magnitude of DNA synthetic activity was similar in all groups, representing a 70-90-fold increase over baseline levels. The data suggest that glucagon facilitates and foreshortens the presynthetic phase of the hepatocellular cycle prior to the mitosis required for regeneration.

1754 CHANGES IN LIVER AND GASTRIC MUCOSAL HEXOSAMINE SYNTHESIS AFTER RESTRAINT. *(E.)* Sander, L. D.; Chandler, A. M.; Johnson, L. R. (Univ. Texas Med. Sch., Houston). *Gastroenterology* 68(2): 285-293, 1975.

The specific activity of L-glutamine:D-fructose-6-phosphate aminotransferase was measured by the method of Kornfeld in the oxyntic gland mucosas and livers of fasted (18 hr) male Stanley-Gumbreck rats after 1.5-3 hr of immobilization at 4 C. The results were compared with those obtained in rats immobilized at room temperature, in adrenalectomized rats immobilized for 1 hr at 4 C, and in rats which were injected s.c. with 5 mg/kg atropine sulfate prior to immobilization at 4 C for 3 hr. Immobilization of normal fasted rats for 3 hr resulted in a 100% frequency of lesion formation (ulceration) associated with decreased enzyme activity in the oxyntic gland mucosa (70.1% control values) and in the liver (25.2% control). The enzyme activity returned to control levels in the stomach 9 hr after immobilization and in the liver 21 hr after immobilization. Immobilization of normal fasted rats for 1.5 hr decreased the oxyntic gland mucosa enzyme activity to 21.0% of control values, although the frequency of lesion formation was only 62.5%; the liver enzyme activity was 51.3% of control values. The concentration of UDP-N-acetylhexosamines, feedback inhibitors of this enzyme, were not altered in either tissue. Maintenance of unrestrained rats in a cold environment for 3 hr and immobilization of rats at room temperature for up to 20 hr caused neither lesion formation nor enzyme activity changes in either tissue. Adrenalectomy, which increased the damage after 1 hr of immobilization, enhanced the decreases in enzyme activity in both tissues, while atropine sulfate, which decreased the frequency of damage after 3 hr of immobilization, had no significant effect on the enzyme activity. Thus, immobilization of rats in a cold environment decreases or alters the synthesis of hexosamine-containing compounds through a mechanism not dependent on acid secretion or adrenocorticoids. This alteration in synthesis may result not only in abnormal mucus secretion, but also in altered cell membrane structure and function.

1755 NITROGEN METABOLISM IN THE PERFUSED CIRRHOTIC LIVER OF THE RAT. *(E.)* Henley, K. S.; Clancy, P. E.; Laughrey, E. G.; Lyra, L. G. C. (Univ. Michigan Med. Sch., Ann Arbor). *Lab. Clin. Med.* 85(2):273-280, 1975.

The isolated perfused liver of the cirrhotic rat was used to study the effect of ethanol and nutrition on the uptake of ammonia, or the fate of alanine, in the cirrhotic liver. Male Sprague-Dawley rats were maintained for 6 months on a cirrhogenic diet or normal laboratory diet (control). Some of the rats maintained on the cirrhogenic diet were given a normal diet for 10 days before perfusion (prefed group). Prefeeding significantly lowered the endogenous ammonia output by cirrhotic livers but did not restore the ammonia output to levels found in normal livers. During the 5-20 min perfusion period, the output of urea was also significantly lower in cirrhotic animals. Addition of ammonia to the perfusate invariably increased the output of urea. Ornithine increased both the uptake of ammonia and the output of urea in controls. In cirrhotic animals, ammonia was released into the perfusate rather than taken up by the liver, and the addition of ornithine had a nonsignificant effect in lowering the rate of ammonia release, ornithine did not increase the output of urea. Prefeeding restored the uptake of ammonia to control levels but did not restore the ability to increase the output of urea in the presence of ornithine. The addition of ethanol to the perfusate lowered the rate of uptake of ammonia in controls but did not significantly alter the output of urea. Ethanol lowered the output of urea in cirrhotic livers and nonsignificantly increased the output of ammonia. Ethanol changed neither the uptake of ammonia nor the output of urea in prefed animals. In the presence of aniline the rate of output of urea by cirrhotic and prefed cirrhotic liver was lower than that of normal livers, while the rate of ammonia output increased progressively from normal, to the prefed, to the cirrhotic liver. In cirrhotic and prefed rats, ethanol increased the amount of nitrogen recovered from alanine without significantly changing its uptake; normal livers showed an increase in the output of ammonia and glutamine. Ethanol decreased the formation of glucose by normal and prefed rats, but did not affect its formation in cirrhotic livers perfused with ammonia and ornithine. The results indicate that the cirrhotic rat liver is a source of endogenous ammonia and that the magnitude of that contribution is modified by diet and ethanol.

1756 STUDY OF THE ROLE OF THE SPLANCHNIC ORGANS IN HEPATIC ATROPHY FOR THE PURPOSE OF AUXILIARY TRANSPLANTATION OF THE LIVER. *(E.)* Serrou, B.; Michel, H.; Gelis, C.; Solassol, C.; Pujol, H.; Romieu, C. (St. Eloi Hosp., Montpellier, France). *Ann. Surg.* 180(3):274-278, 1974.

An attempt was made to identify substances in the blood which might be responsible for hepatic atrophy in auxiliary transplantation of the liver. Experimental operations were undertaken based on a variety of shunted blood vessels and the excision of isolated or associated organs in dogs. Blood flow was measured and liver structure and function were studied. Experiments with 7 series of dogs included organ removals (splenectomy, pancreatectomy) and shunts (splenocaval derivation, mesenterico-caval shunt, spleno-mesenterico-caval shunt). Five to 8 dogs were used in each series for a total of 68 dogs. Hepatic biochemical tests, determination of hepatic blood flow (by ^{198}Au, ^{90}Kr, Bengal Rose, and Indocyanine Green) and serial liver biopsies before and after surgery (and in the long survivals) were performed. Results show a flow decrease of 32.3% and 20.6% after mesenterico and spleno-cava derivations. Histologically, a swollen cytoplasm was encountered (probably due to this important flow decrease); but no modifications of the cells (atrophy) nor of their fat and glycogen content were observed. After pancreatectomy there was a flow decrease of 14.2% and liver cord atrophy, bile retention, important fatty degradation, and disappearance of glycogen were seen. All of these modifications were avoided by giving insulin s.c. after pancreatectomy. These results suggest that graft atrophy after auxiliary liver transplantation is due in part to an insufficient supply of insulin.

1757 EFFECTS OF ETHANOL ON HEPATIC MICROSOMAL DRUG-METABOLIZING ENZYMES IN THE RAT. *(E.)* Liu, S. J.; Ramsey, R. K.; Fallon, H. J. (Univ. North Carolina Sch. Med., Chapel Hill). *Biochem. Pharmacol.* 24(3):369-378, 1975.

The activities of several hepatic microsomal drug-metabolizing enzymes were determined by various methods in male and female Sprague-Dawley rats after administration of 20% ethanol or an isocaloric amount of glucose in drinking water for 10-49 days. The aniline hydroxylase activity increased 20-72%, whereas the activities of both pentobarbital hydroxylase and benzphetamine N-demethylase were decreased about 33% in male rats given ethanol (4 g/kg) and killed without ethanol withdrawal. Twenty-four hr after removal of ethanol, the aniline hydroxylase remained elevated but a 30-40% increase of both pentobarbital hydroxylase and benzphetamine N-demethylase above control values occurred. Six days later, all 3 of these microsomal enzymes returned to normal control values. The reduction in pentobarbital hydroxylase and benzphetamine N-demethylase could not be attributed simply to high endogenous ethanol levels since: 1) addition of high concentrations of ethanol *in vitro* inhibited microsomal aniline hydroxylase and pentobarbital hydroxylase but did not reduce benzphetamine N-demethylase; and 2) acute administration of ethanol p.o. by gastric tube, which markedly elevated the blood ethanol level, did not result in a decline in the enzyme activities. These 2 findings suggest the observed decrease in microsomal enzymes in male rats required persistent ethanol exposure. In contrast to male rats, female rats given ethanol for 28 days showed a 50% increase in aniline hydroxylase activity, but the activities of pentobarbital hydroxylase and benzphetamine N-demethylase were not decreased. Moreover, administration of ethanol for 28 days to female rats did not reduce the response of these 3 enzyme activities to pentobarbital administration. It is concluded that the effects of chronic ethanol ingestion on the hepatic microsomal drug-metabolizing enzymes are complex and depend on sex, exposure to other agents and, most importantly, on the duration and proximity of ethanol intake.

1758 EFFECT OF ACUTE ETHANOL ADMINISTRATION ON TRYPTOPHAN OXYGENASE ACTIVITY IN RAT LIVER.

(E.) Morland, J. (Dep. Pharmacol., Univ. Oslo, Norway). *Acta Pharmacol. Toxicol. (Kbh.)* 35(5): 347-360, 1974.

Tryptophan oxygenase activity was studied in liver homogenates from male Wistar rats following short-term ethanol administration. Ethanol was given in the following ways: 1) p.o. mixed with sucrose in drinking water *ad lib* for 1 or 18-21 hr; 2) i.p. as a single dose (2.5 or 3.3 g/kg). Short-term ethanol treatment was also given to animals which had received prior ethanol treatment for 3-4 weeks. Ethanol was added in some studies to perfusates of isolated livers (final concentration 0.2%). Although p.o. ethanol caused only a slight increase in tryptophan oxygenase activity and no change in plasma corticosterone levels, i.p. injection produced a 337% rise in liver enzyme activity and about a 400% increase in plasma corticosterone concentration. Cycloheximide (1.5 mg/kg) reversed the increase in tryptophan oxygenase activity following i.p. ethanol injection. Ethanol had no effect on basal enzyme activity of perfused liver but did slightly enhance induction by dexamethasone. Degradation of tryptophan oxygenase in perfusates following cycloheximide administration (20 μg/ml) was unaffected by ethanol. I.p. injection of ethanol into rats pretreated with ethanol produced a 268% increase in hepatic enzyme activity, a value less than that for normal rats. Tryptophan oxygenase activity in ethanol-pretreated rats was significantly reduced following p.o. ethanol ingestion. The acute stimulatory effect of ethanol on tryptophan oxygenase activity of the rat thus appears to be due to a rise in plasma corticosterone which induces enzyme synthesis.

1759 A POSSIBLE MECHANISM FOR THE PEROXIDATION OF LIPIDS DUE TO CHRONIC ETHANOL INGESTION.

(E.) Reitz, R. C. (Dep. Biochem., Univ. North Carolina, Chapel Hill). *Biochim. Biophys. Acta* 380 (2):145-154, 1975.

The effects of chronic ethanol ingestion on NADPH-oxidase and on the NADPH-catalyzed peroxidation of lipids in rat liver microsomes were studied. Male Buffalo rats were maintained for 1 month on carefully controlled diets of Purina Lab Chow (41-67 kcal/day), with 1 group receiving 20% ethanol (32% of the total daily intake of calories) as the only source of drinking water and another group receiving an isocaloric amount of glucose in the drinking water. The intake of vitamin E was 0.8-1.2 mg/day. Chronic ethanol ingestion resulted in an increase in the activity of microsomal NADPH oxidase; the increase was not due to major variations in protein or RNA concentrations. In addition, the ethanol-treated animals had about 1.5 times the rate of formation of malondialdehyde as did the controls; this difference was statistically significant. In the control rats, there was a lag before the formation of malondialdehyde became linear with time; chronic ethanol ingestion shortened this lag. Compared with controls, the energy of activation for the formation of malondialdehyde was significantly elevated in ethanol-treated animals. Chronic ethanol ingestion enhanced the ability of the microsomal fraction to consume oxygen when incubated in the lipid peroxidation system. It also resulted in significant changes in the composition of the polyenoic fatty acids of the microsomes: arachidonate decreased, while linoleate increased. The C_{22} polyenes showed a nonsignificant decrease. Ethanol ingestion appeared to induce changes in the microsomal membranes which resulted in additional or alternate, possibly abnormal, pathways for lipid peroxidation becoming functional. The data also indicate that ethanol ingestion enhanced the production of peroxides *via* the microsomal-catalyzed oxidation of NADPH.

1760 DISTRIBUTION OF ZINC IN SKELETAL MUSCLE AND LIVER TISSUE IN NORMAL AND DIETARY CONTROLLED ALCOHOLIC RATS.

(E.) Wang, J.; Pierson, Jr., R. N. (St. Luke's Hosp. Cent., Columbia Univ., New York, N.Y.). *Lab. Clin. Med.* 85(1):50-58, 1975.

The compartmental distribution of zinc in the intracellular components of normal and alcoholic rats was studied, along with the relationships between serum and tissue zinc levels and the correlation between these parameters and the development of alcoholism. Five 6-week-old male Sprague-Dawley rats were given laboratory chow and 20% ethanol as the sole source of drinking water; controls were given tap water. After 2, 5, 9, or 14 weeks, the animals were killed and the zinc levels in tissue measured by atomic absorption spectroscopy. Zinc levels in tissues of control rats remained stable at 108 μg/ml (plasma), and 125 (muscle), 30.3 (muscle cell sap), 70 (muscle cell sap-free fraction), 209 (muscle mitochondria), 198 (liver), 125 (liver cell sap), 79.5 (liver cell sap-free fraction), and 291 μg/g dry tissue (liver mitochondria). The ethanol-fed rats showed marked decreases in all liver fractions after 2 weeks, the value being 120 μg/g in the total liver tissue after 2 weeks. The greatest decrease (to 35% of control values) was seen in the liver mitochondria. The zinc levels in the muscle tissue and plasma showed monotonic gradual declines at the rate of 3% week, become statistically different from control values after 9 weeks. The control rats showed normal weight gain, while the ethanol-fed rats gained at a rate of 52% control values up to 5 weeks, showing no subsequent gain and weighing only 62% of control values at 14 weeks. The results indicate that, although the liver mitochondria are significantly more affected by plasma alcohol than muscle mitochondria, the zinc-depleting effects of alcohol are not specific for the liver.

1761 ANALYTICAL STUDY OF MICROSOMES AND ISOLATED SUBCELLULAR MEMBRANES FROM RAT LIVER. IV. BIOCHEMICAL, PHYSICAL, AND MORPHOLOGICAL MODIFICATIONS OF MICROSOMAL COMPONENTS INDUCED BY DIGITONIN, EDTA, AND PYROPHOSPHATE.

(E.) Amar-Costesec, A.; Wibo, M.; Thines-Sempoux, D.; Beaufay, H.; Berthet, J. (Physiol. Chem. Lab., Univ. Louvain, Belgium). *J. Cell Biol.* 62(3):717-745, 1974.

Rat liver microsomal constituents were classified according to physical properties and cytological location after treatment with digitonin, pyrophosphate and EDTA. Homogenates from 0.27 g fresh weight of liver/ml were fractionated in 0.25 M sucrose (pH 7.4) and the resulting pellets treated with either 0.235% (weight/volume) digitonin, 15 mM sodium pyrophosphate (pH 8.2), 50 mM EDTA (pH 7.4) or with 0.235% (weight/volume) digitonin after centrifugatin of EDTA-treated (50 mM) pellets. Microsomes were centrifuged at an integrated force of 3 or 9 x 10^{10} $rad^{2} \cdot s^{1}$ before isopycnic equilibration or differential sedimentation, resp. Enzyme activities were unaffected by the various treatments, except that EDTA caused partial inactivation of 5'-nucleotidase. Digitonin did not affect the sedimentation properties of any of the constituents nor did it alter the morphology of the microsomes except that a few large smooth elements appeared broken or fenestrated as seen by electron microscopy. Digitonin significantly increased the median densities of the constituents in the group classified as *a2* (5'-nucleotidase, alkaline phosphodiesterase I, alkaline phosphatase, and cholesterol from 0.028 to 0.035 density units) and group *a3* (galactosyltransferase 0.014 units), but did not affect the other microsomal constituents. Pyrophosphate and EDTA detached a substantial part of RNA and released a significant amount of protein. Both also decreased the densities of the microsomal constituents in group *a2* slightly, and greatly decreased the densities in group *b* (NADH cytochrome c reductase, NADPH cytochrome c reductase, aminopyrine demethylase, cytochrome b_5 and P 450) and group *c* (glucose 6-phosphatase, esterase, nucleoside diphosphatase, β-glucuronidase and glucuronyltransferase). The combination of EDTA and digitonin increased the mean density of group *a2* compared with that of groups *b* and *c*. Dense subfractions showed mainly broken appearing vesicles after treatment with the combination under the electron microscope. It is suggested that the microsomal constituents in group *a1* (monoamine oxidase) are located in the outer membranes of mitochondria, those in group *a2* in the plasma membranes, those in *a3* in the Golgi complex, those in both groups *b* and *c* in the smooth and rough endoplasmic reticulum, and RNA and ribosomes in the rough endoplasmic reticulum. In conclusion, the behavior of the constituents after treatment with digitonin, EDTA, and pyrophosphate confirmed the classification from previous studies of rat liver microsomal constituents.

1762 PERINATAL DRUG METABOLISM AND MORPHOLOGICAL CHANGES IN THE HEPATOCYTES OF NORMAL AND PHENOBARBITAL-TREATED GUINEA PIGS.

(E.) Kuenzig, W.; Kamm, J. J., Boublik, M.; Jenkins, F.; Burns, J. J. (Roche Inst. Mol. Biol., Nutley, N.J.). *J. Pharmacol. Exp. Ther.* 191(1):32-44, 1974.

Microsomes were isolated from the livers of guinea pig fetuses delivered by cesarean section days 33, 45, 53, and 63 of gestation and from the livers of neonatal and adult guinea pigs. Benzo(a)pyrene, *p*-chloro-N-methylaniline, and chlorcyclizine were used as substrates to measure the rate of development of drug metabolic activity. Some animals were subjected to acute phenobarbital pretreatment by the administration of sodium phenobarbital to pregnant dams for 3 days at a dose of 100 mg/kg in the drinking water (1 mg/ml); the animals drank about 10 ml/day/100 g. Phenobarbital was administered chronically at a dose of 30 mg/kg daily in the drinking water (0.3 mg/ml) for 14 days from day 49 through day 62 of gestation. The oxidation of the drug substrates and the rate of reduction of cytochrome P-450 increased slowly during the fetal life of the guinea pig whereas the concentration of cytochrome P-450 in the liver increased rapidly. Forty-eight to 72 hr after birth, substrate oxidation and P-450 reduction occurred at a rate equal to or greater than the rate observed in preparations from adult animals, but the concentration of cytochrome P-450 was slightly below adult levels. Acute sodium phenobarbital pretreatment stimulated the hepatic benzo(a)pyrene hydroxylase activity in the fetus through the second half of gestation (days 33-63). *p*-Chloro-N-methylaniline demethylase and cytochrome P-450 reductase activities, as well as cytochrome P-450 levels, were not induced by phenobarbital treatment of the dam until just prior to parturition (day 63). The ultrastructure of the hepatocyte of the developing guinea pig was examined by electron microscopy and a direct correlation between microsomal mixed-function oxidase activity and the proliferation of the smooth endoplasmic reticulum was observed in normal and phenobarbital-treated animals. The results of this investigation are consistent with the hypothesis that factors which control the proliferation of the smooth endoplasmic reticulum are also important in controlling the level of hepatic microsomal mixed-function oxidation.

1763 RATE-LIMITING STEPS IN DRUG METABOLISM BY MICROSOMES FROM CCl_4-CIRRHOTIC RAT LIVER.

(E.) Tsyrlov, I. B.; Lyakhovich, V. V. (Acad. Med. Sci. USSR, Siberian Branch, Novosibirsk). *Chem. Biol. Interact.* 10(2):77-89, 1975.

The substrate-binding capacity of microsomal cytochrome P-450, the activity of the enzymes in the NADPH-dependent electron-transport chain, and other possible rate-limiting factors in determining the overall rate of hydroxylation reactions by the microsomal fraction of the cirrhotic liver was studied. Histological symptoms of subacute toxic hepatitis and cirrhosis were produced in male Wistar rats following 3-6 weeks of biweekly periods of poisoning by CCl_4 inhalation. The development of CCl_4-cirrhosis was accompanied by a decrease in the metabolizing activity of type-I (aminopyrine, hexobarbital), type-II (aniline, metyrapone), and "modified type-II" (corticosterone) substrates in liver microsomes. Cytochrome P-450 content also appeared to decrease during chronic CCl_4 intoxication. The hydroxylation activity of the type-II and "modified type-II" substrates during the period of cirrhotic development was determined by the P-450 content and the amplitude of maximal spectral changes observed in the presence of excess substrate. Type-I substrate metabolism, however, was limited in the precirrhotic phase by the state of the "substrate-binding protein" contained in P-450 as well as by the activity of NADPH-cytochrome P-450 reductase. On the other hand, the *N*-demethylating activity in the cirrhotic microsomes did not depend on the concentration of P-450, on the amplitude of the maximal spectral changes, or on the K_s value. The data suggest that NADPH-cytochrome P-450 reductase activity is a rate-controlling reaction, in the metabolism of aminopyrine by cirrhotic liver microsomes.

1764 LIPID PEROXIDATION IN ISOLATED HEPATOCYTES.

(E.) Hogberg, J.; Orrenius, S.; Larson, R. E. (Dep. Forensic Med., Karolinska Inst., Stockholm, Sweden). *Eur. J. Biochem.* 50(3):595-602, 1975.

Studies were conducted to determine whether peroxidation of intracellular lipids could be induced by addition of ADP-complexed ferric iron to hepatocytes isolated from male Sprague-Dawley rat livers perfused with a collagenase-hyaluronidase solution. Both the production of malondialdehyde (thiobarbituric-acid-reacting substances) and of conjugated dienes was dependent on the ADP-Fe^{3+} concentration (10-80 μM) in a dose-related fashion. Malondialdehyde formation stopped spontaneously within 20 min after the initiation of the reaction and the plateau reached was also related to the ADP-Fe^{3+} concentration. Control experiments revealed that more than 90% of the malondialdehyde accumulating during the incubation period could be ascribed to intracellular production. The cellular NADPH/NADP ratio was always high and only slightly decreased upon ADP-Fe^{3+}-induced lipid peroxidation. The rate of accumulation of malondialdehyde as well as the final level reached during ADP-Fe^{3+}-initiated lipid peroxidation was increased about 30% by the addition of chloral hydrate (10 mM). This apparent stimulatory effect could, however, be ascribed to the inhibition of the mitochondrial oxidation of the malondialdehyde formed during cellular lipid peroxidation, thus allowing more malondialdehyde to accumulate during the process. ADP-Fe^{3+}-induced cellular lipid peroxidation was associated with a 42% decrease in the concentration of glutathione. Also, lowering of the intracellular glutathione level by the addition of diethyl maleate or by simply preincubating the hepatocytes (up to 50 min) promoted the ADP-Fe^{3+} malondialdehyde production, observed even at ADP-Fe^{3+} concentrations which were too low to induce measurable lipid peroxidation in fresh hepatocytes. It is thus concluded that glutathione has an important role in the cell defense against lipid peroxidation. It is further suggested that the isolated hepatocytes provide a suitable experimental model system for the characterization of this and other possible cellular defense mechanisms and how they are affected by the nutritional status of the donor animal.

1765 AGE-RELATED CHANGES IN LIPID PEROXIDATION IN RAT LIVER MITOCHONDRIA.

(E.) Barrett, M. C.; Horton, A. A. (Dep. Biochem., Univ. Birmingham, England). *Biochem. Soc. Trans.* 3(1):124-126, 1975.

Lipid peroxidation by means of the thiobarbituric acid reaction was studied in freshly isolated rat liver mitochondria and mitochondria treated with ascorbate. The mitochondria were isolated from the livers of female Wistar rats allowed food and water *ad libidum*. As indicated by the concentrations of malondialdehyde in the mitochondria, the peroxidation potential increased about 2.3-fold as the age of the animal increased from 3-24 months; the peroxidation measured in freshly isolated mitochondria was small and fell with age after 6 months. The increase in peroxidation potential may suggest an age-related increase in the degree of polyunsaturation of the mitochondrial lipids. Mitochondrial lipids were assayed for the degree of unsaturation by an iodometric titration; cholesterol contributed less than 1% of the double bonds measured. Little change was noted in the cholesterol:protein ratio of mitochondria with increasing age of the animal. The total degree of unsaturation of the mitochondrial lipids fell in the 3-12-month-old rats and then rose in the 12-24-month-old animals. The discrepancy between this relationship and the observed rise in peroxidation potential with age may be explained in terms of an age-linked increase in the proportion of polyunsaturated fatty acids and a decrease in the proportion of mono-unsaturated fatty acids in the mitochondrial lipids. The observed trends were not due to survival factors in individual animals.

1766 STUDIES ON THE SYNTHESIS AND INTRACELLULAR TRANSPORT OF LIPOPROTEIN PARTICLES IN RAT LIVER.

(E.) Glaumann, H.; Bergstrand, A.; Ericsson, J. L. E. (Sabbatsberg Hosp., Karolinska Inst., Stockholm, Sweden). *J. Cell Biol.* 64(2):356-377, 1975.

Lipoprotein particles (density <1.03 g/ml) isolated from microsomes from smooth and rough endoplasmic reticulum and from the Golgi apparatus of rat liver were characterized chemically and morphologically. Rough endoplasmic reticulum particles were protein rich (50%) and contained smaller amounts of phospholipids and triglycerides. Smooth particles and especially those from the Golgi were rich in triglycerides and phospholipids and resembled very low density lipoproteins. The rough particles were 200-800 Å in diameter (mean = 420 Å); the smooth particles 200-900 Å (520 Å); Golgi particles 350-950 Å (580 Å); and very low density lipoproteins 300-800 Å (450 Å). In general, lipoprotein particles were rare in the rough endoplasmic reticulum, frequent but diffusely situated in the smooth endoplasmic reticulum, and occurred mainly in clusters in "secretory vesicles" of the Golgi complex. They were rarely seen in the cisternal compartments of the Golgi complex. Following injection of ^{3}H-glycerol, label was initially (15 min) seen in triglycerides and later primarily in phospholipids. Three intracellular triglyceride pools were identified: 1) a cytoplasmic pool with a slow turnover rate; 2) a membrane-associated pool and; 3) a pool corresponding to the triglyceride moiety of the lipoprotein particles, which had the highest initial rate of labeling and fastest turnover. Pulse labeling with ^{3}H-glycerol showed peak labeling at 6 min in both smooth and rough microsomal lipoproteins followed at 10-20 min by peak labeling of the Golgi lipoproteins and finally, after an additional 10-15 min, peak labeling of very low density lipoproteins in serum. It is concluded that the assembly of the apoproteins and lipid moieties into lipoprotein particles, the putative precursors of liver very low density lipoproteins, begins in the rough and continues in the smooth endoplasmic reticulum with discharge into the circulation from the Golgi apparatus.

1767 GROWTH HORMONE STIMULATION OF AMINO ACID TRANSPORT AND UTILIZATION BY THE PERFUSED RAT LIVER.

(E.) Jefferson, L. S.; Schworer, C. M.; Tolman, E. L. (Milton S. Hershey Med. Cent., Hershey, Pa.). *J. Biol. Chem.* 290(1):197-204, 1975.

The effects of growth hormone, both *in vivo* and *in vitro*, on amino acid transport and utilization were studied in perfused livers from normal and hypophysectomized male Wistar rats. Amino acid transport was studied using 2 isotopically-labeled nonmetabolizable amino acid analogues, α-aminoisobutyric acid and 1-aminocyclopentane carboxylic acid (cycloleucine). When normal or hypophysectomized animals were given α-aminoisobutyric acid cycloleucine 24 hr before sacrifice, steady-state distribution ratios between liver and plasma were 4.6 and 5.6, resp., for α-aminoisobutyric acid and from 1 to 2 in both cases for cycloleucine. Treatment with bovine growth hormone (1 mg/100 g, i.v.) 1 hr prior to sacrifice increased the steady-state distributions for both analogues by 19% in normal livers and by 46-48% in livers from hypophysectomized rats. Treatment with growth hormone *in vivo* followed by *in vitro* perfusion with α-aminoisobutyric acid or cycloleucine produced increases in the steady-state distribution ratios which were apparently comparable to those seen *in vivo*. Growth hormone treatment increased the maximum velocity of α-aminoisobutyric acid and cycloleucine accumulation by over 2-fold while only slightly increasing the substrate concentration necessary for half-maximal transport velocity. *In vitro* studies in which livers from hypophysectomized rats were perfused with a nonrecirculating medium containing cycloleucine and growth hormone (1 μg/ml) showed a 30% increase in the distribution ratio, indicating that growth hormone was exerting a direct effect in stimulating amino acid accumulation. In the same *in vitro* system, growth hormone also produced: 1) a 23% increase in the rate of incorporation of ^{14}C-valine into liver protein; 2) a 2-fold increase in the rate of gluconeogenesis as determined from the rate of conversion of ^{14}C-amino acids to ^{14}C-glucose; 3) a 40-50% increase in urea production; and 4) 40-250% increases in the intracellular concentrations of threonine, serine, proline, glycine, alanine, lysine and arginine. The last finding indicated that the effects of growth hormone on the first 3 were due to its stimulation of amino acid transport. The time required for a significant effect of growth hormone on amino acid metabolism in the perfused liver was 20-25 min. These data thus confirm and extend previously published findings of stimulated hepatic amino acid transport *in vivo* in growth hormone-treated rats.

1768 VASOACTIVE INTESTINAL POLYPEPTIDE: INACTIVATION IN LIVER AND POTENTIATION IN LUNG OF ANESTHETIZED DOGS.

(E.) Kitamura, S.; Yoshida, T.; Said, S. I. (Univ. Texas Southwest. Med. Sch., Dallas). *Proc. Soc. Exp. Biol. Med.* 148(1):25-29, 1975.

The role of the liver and lung in the inactivation or potentiation of the biological activity of the vasoactive intestinal polypeptide was examined in 5 anesthetized mongrel dogs. Infusions of the peptide were made into the right ventricle, the left ventricle, and the portal vein; each animal received 4 doses, ranging from 0.29-2.23 μg/kg. Systemic arterial blood pressure, tidal volume, breathing frequency, and minute ventilation were measured continually. The biological effects of the peptide were measured in terms of decreases in arterial blood pressure and respiratory stimulation. The peptide elicited a hypotensive response which became more pronounced with increasing dosage. For any given dose, the magnitude of the hypotension was always smallest and its duration shortest after infusions into the portal vein. Except for the smallest dose, infusions of the peptide into the right or left ventricle were always followed by an increase in minute ventilation. However, the mean respiratory stimulation in all 5 dogs following portal infusion was significantly smaller than that resulting from right ventricular infusion. Infusions into the right ventricle were somewhat more potent than infusions into the left ventricle. The apparent inactivation of vasoactive intestinal polypeptide during passage through the liver implies that its actions may be confined to the gastrointestinal tract, the liver, and the portal circulation. The increase in biological activity of the peptide during passage through the lung may be attributable to the release of additional vasodilator substances or to further activation of the peptide.

1769 SERUM ANTITRYPSIN SYNTHESIS BY THE ISOLATED PERFUSED RAT LIVER. *(E.)* Rowley, P. T.; Miller, L. L. (Univ. Rochester Sch. Med. Dent., New York). *Proc. Soc. Exp. Biol. Med.* 148(1):145-150, 1975.

The isolated perfused rat liver was studied to establish the liver as the site of serum antitrypsin synthesis. Although the pattern of antitrypsin activity of normal rat serum differs from that of human serum, both show the greatest activity/mg protein in the α-globulin fraction. When a liver from a normal rat was perfused for 12 hr with a medium containing glucose and amino acids, the antitrypsin activity rose steadily throughout. Cortisol plus insulin caused no change in the rate of synthesis of antitrypsin activity over a 24-hr period. The isolated perfused rat liver appeared to synthesize antitrypsin at 10 times its *in vitro* rate. The antitrypsin activity of the rat perfusate resembled that of normal human plasma in regard to heat lability (loss of 45% of its activity in 5 min at 56 C), acid lability (loss of activity below pH 6), and apparent molecular size as determined by elution on Sephadex G-200 columns. Starch block electrophoresis revealed 2 peaks of antitrypsin activity in the rat liver perfusate: a broader peak at the trailing edge of the α_1-globulin region; and a sharper peak in the β-globulin region. The data suggest that in the rat, the liver synthesizes material with properties similar to those of human α_1-antitrypsin at a rate compatible with the liver as the principle site of synthesis.

1770 EXTRAHEPATIC DISTRIBUTION OF SULFOBROMOPHTHALEIN. *(E.)* Klaassen, C. D. (Univ. Kansas Med. Cent., Kansas City). *Can. J. Phys. Pharm.* 53(1): 120-123, 1975.

The body tissue distribution and biliary excretion of BSP was studied in male Sprague-Dawley rats. When BSP was administered i.v. to rats at four different doses (18.75, 37.5, 75, and 150 mg/kg), less than 0.5% of each dose was excreted into the urine and between 70 and 85% was excreted into the bile within 6 hr after administration. When the amount of BSP was measured in plasma, liver and bile 10 min after the i.v. administration of either a high (150 mg/kg) or a low (18.75 mg/kg) dose of BSP, only 60% of the dose was accounted for. The concentration of BSP and ^{125}I-labeled albumin was measured in various tissue samples 10 min after administration of 17.5 or 150 mg of BSP or [^{125}I]albumin/kg. More BSP was found in all tissues than was contained in the plasma. Thus, the distribution of BSP is not limited to the liver and plasma. It is concluded that during excretion, BSP leaves other tissues (kidney, spleen, lung, etc.) and is ultimately excreted into the bile.

1771 THE PROPERTIES OF HYDROGEN PEROXIDE PRODUCTION UNDER HYPEROXIC AND HYPOXIC CONDITIONS OF PERFUSED RAT LIVER. *(E.)* Oshino, N.; Jamieson, D.; Chance, B. (Sch. Med., Univ. Pennsylvania, Philadelphia). *Biochem. J.* 146(1):53-65, 1975.

The properties of H_2O_2 production were examined in the hemoglobin-free, non-circulatory perfused livers of male Holzman rats. H_2O_2 production was determined by spectrophotometric measurement of the catalase-H_2O_2 intermediate. The H_2O_2 production with 1 mM lactate and 0.15 mM pyruvate was 82 nM/min/g liver or 333 nM/min/100 g body weight in the liver of fed rats at 30 C. This rate decreased to almost half in the livers of starved and phenobarbital-pretreated rats. When H_2O_2 production was stimulated by urate infusion, (0-100 μM), almost all of the H_2O_2 produced by the uricase reaction was decomposed by the catalase reaction. During the demethylation reaction of aminopyrine, no change in H_2O_2 production was detected by the present method. Thus, microsomal H_2O_2 production observed in isolated subcellular fractions appeared not to contribute significantly to H_2O_2 production in the whole organ. Whereas the rate of the glycolate-dependent H_2O_2 was halved at an intracellular O_2 concentration that caused a 10% increase in the reduction state of cytochrome c, the half-maximal rate of H_2O_2 production with lactate and pyruvate was observed at an O_2 concentration that caused a 40% increase in the reduction state of cytochrome c in the liver. No further increase in the rates of H_2O_2 production was obtained by increasing O_2 pressure up to 5 x 10^5 ambient pressure. The rate of ethanol oxidation through the catalase 'peroxidatic' reaction varied, depending on the substrate availability. The maximal capability of this pathway in ethanol oxidation reached approximately 1.5 μM/min/g liver, when a mixture of urate, glycolate and octanoate was infused to enhance H_2O_2 production. These studies indicate that endogenous H_2O_2 production detected in the perfused liver is most likely of mitochondrial origin, that the primary events associated in the O_2-toxicity phenomenon are not produced in the H_2O_2 producing reactions of the perfused liver, and that this microsomal H_2O_2 producing system has no significant physiological role in ethanol metabolism in this system.

1772 INDUCTION OF CYSTATHIONASE IN HUMAN FOETAL LIVER. *(E.)* Heinonen, K.; Raiha, N. C. R. (Dep. Med. Chem., Univ. Helsinki, Finland). *Biochem. J.* 144(3):607-609, 1974.

Liver explants from second-trimester human fetuses were incubated with dexamethasone, glucagon, or dibutyryl cyclic AMP plus theophylline to determine whether cystathionase can be induced in organ culture. Explants less than 1 mm^3 were placed on wire grids at the liquid gas interphase and preincubated for 24 hr before addition of the agents. Eagle's minimum essential medium with Hank's balanced-salt solution containing twice the normal concentration of glucose, glutamine and bicarbonate (pH 7.6) was used. No cystathionase activity was found in fresh specimens, but a post-mortem sample from a full-term infant showed 70 nM cysteine/60 min/mg protein. Also, no cystathionase activity was found in fetuses

30-50 mm, and only trace amounts in those 90-170 mm after 48 hr incubation. Addition of pyridoxal 5'-phosphate (1-100 μg/ml) did not increase the activity of cystathionase in any of the fetuses. Dibutyryl cyclic AMP (0.2 mM) plus theophylline (0.5 mM) significantly increased the activity of cystathionase to 192 nM/60 min/mg protein compared with controls (31 nM/60 min/mg protein). This activity was significantly more than than that produced by either agent alone at the same or 10-fold concentrations. Dexamethasone (60 μg/ml) and glucagon (100 μg/ml) produced similar effects. Simultaneous incubation with cycloheximide (10 μg/ml) or actinomycin D (30 μg/ml) abolished the effects of the inducing agents. The activity of cystathionase could not be stimulated in the explants from the smallest (early first-trimester) fetuses. This suggests that protein synthesis is required for the increased enzyme activity; thus, a certain developmental stage must be reached before fetal liver tissue has this competence to respond to externally administered pharmacological agents. It is concluded that cystathionase activity can be induced in second-trimester human fetal liver *in vitro*.

1773 STUDIES ON BILIRUBIN AND STEROID GLUCURONIDATION BY RAT LIVER MICROSOMES. *(E.)* Jacobson, M. M.; Levin, W.; Conney, A. H. (Dep. Biochem. Drug Metab., Hoffman-La Roche, Inc., Nutley, N.J.). *Biochem. Pharmacol.* 24(6):655-662, 1975.

The effects of *in vivo* phenobarbital administration and the *in vitro* addition of detergents on the glucuronidation of bilirubin and several steroids by rat liver microsomes were studied. In short term experiments, sodium phenobarbital (75 mg/kg/day) was administered i.p. for 3-4 days to male and female Long Evans rats. In long term experiments, the drug was administered in the drinking water to male and female Long Evans rats (175 mg/kg/day) and male and female homozygous Gunn rats (100 mg/kg/day) for 20 days. The addition of digitonin, cholate, Triton-X-100, Emulgen 911, Triton N-101, and deoxycholate to the microsome preparations from phenobarbital-treated and control rats increased the glucuronidation of bilirubin, testosterone, estradiol, estrone, and estriol. The extent of activation by digitonin and the concentration causing maximal activation were substrate dependent. There was a partial requirement for Mg^{++} in steroid glucuronidation. Short-term treatment with sodium phenobarbital increased the glucuronidation of testosterone and estradiol/mg of protein but had no effect on estrone glucuronidation. Administration of the drug for 20 days to Long Evans rats increased bilirubin, testosterone, and estrone glucuronidation/mg protein, but had little or no effect on estradiol and estriol glucuronidation. However, when UDP-glucuronyl transferase activity was calculated/g liver (wet weight), an increase in the glucuronidation of estriol and estradiol was seen, resulting from the large stimulatory effect of phenobarbital on the synthesis of total microsomal protein. Liver microsomes from Gunn rats, deficient in the ability to conjugate bilirubin, did conjugate testosterone, estradiol, estrone, and estriol. Digitonin increased the glucuronidation of testosterone but not that of estrone; sodium phenobarbital stimulated microsomal steroid glucuronidation to varying degrees. The data suggest that there are several glucuronyl transferases in rat liver microsomes, and that the glucuronyl transferase for bilirubin is different from the enzyme(s) which metabolizes testosterone, estradiol, estrone, and estriol by glucuronidation.

1774 EXTRAHEPATIC BILIRUBIN FORMATION AND CONJUGATION IN THE DOG. *(E.)* Royer, M.; Noir, B. A.; Sfarcich, D.; Nanet, H. (Dr. A. Posadas Gen. Hosp., Haedo, Argentina). *Digestion* 10(6):423-434, 1974.

The site of formation and distribution of bilirubin formed outside the liver in the dog was studied, along with the chemical nature of the pigment conjugated in nonhepatic tissues. Total hepatectomy, hepatectomy plus splenectomy or enterectomy, or hepatectomy plus splenectomy and enterectomy or bilateral nephrectomy were performed on male and female mongrel dogs. Some of the hepatectomized dogs were injected i.v. with 2 or 10 mg/kg crystalline bilirubin within 15 min after removal of the liver. The animals remained unconscious throughout the study, and blood and urine were collected at 3-hr intervals from those which remained alive for 15 hr or more. After total hepatectomy, increased bilirubin concentrations were found in the circulating plasma and bound in the lung, kidney, small intestine, omentum, and/or heart. Small amounts of the accumulated pigment were also excreted in the urine. Both unconjugated and direct-reacting serum bile pigments increased significantly, especially in the dogs injected with bilirubin. Analysis of the bile pigments in the serum and urine of the hepatectomized animals indicated that approximately 10% of the conjugates were present as bilirubin xyloside and 25% were present as bilirubin glucoside. The results in the enterectomized, splenectomized, and nephrectomized dogs suggested that the spleen, intestine, and kidney may be sites of bilirubin formation and conjugation in the hepatectomized dog. These observations are consistent with the existence of some glucuronyl transferase activity in the kidney and gastrointestinal mucosa.

1775 BILIRUBIN BINDING TO HEPATIC Y AND Z PROTEIN (LIGANDIN): TISSUE BILIRUBIN CONCENTRATIONS IN PHENOBARBITAL TREATED GUNN RATS. *(E.)* Davis, D. R.; Yeary, R. A. (Dep. Vet. Physiol. Pharmacol., Ohio State Univ. Columbus). *Proc. Soc. Exp. Biol. Med.* 148(1):9-13, 1975.

The effects of phenobarbital treatment on the tissue distribution of bilirubin as affected by bilirubin binding to cytoplasmic liver proteins Y and Z were studied in the icteric Gunn rat. Gunn and Sprague-Dawley rats received daily i.p. injections of sodium phenobarbital (80 mg/kg) or saline (control) for 7 or 14 days. After 7 days, the liver UDP-glucuronyltransferase activity was measured, and after 14 days, the plasma bilirubin levels were determined. In another study, Gunn rats were injected i.v. with ^{14}C-bilirubin after 4 or 14 daily injections of sodium phenobarbital. Sodium phenobarbital treatment for 4 days significantly lowered the plasma bilirubin levels in male and female Gunn rats; the levels tended to return to pretreatment values after 14 days of treatment. Phenobarbital treatment resulted in increased levels of *p*-nitrophenol glucuronidation in heterozygous and homozygous Gunn rats; a considerably greater increase was seen in the Sprague-Dawley rats. After 7 days of phenobarbital treatment, bilirubin glucuronidation increased 260% in the Sprague-Dawley rats, 126% in the heterozygous Gunn rats, and not at all in the homozygous Gunn rats. The major bilirubin binding tissues in the homozygous Gunn rat were the liver, carcass, skin, gastrointestinal tract, and blood. Sodium phenobarbital treatment for 4 days significantly increased the percent of ^{14}C-bilirubin recovered from the liver and significantly decreased the amount recovered from the gastrointestinal tract; phenobarbital treatment for 14 days resulted in more pronounced alterations. Bilirubin binding to both Y and Z proteins was significantly increased with phenobarbital treatment in the 4- and 14-day treatment groups, the increase in binding being more pronounced after 14 days. The data suggest that phenobarbital treatment resulted in the induction of Y protein synthesis in the liver and an associated increased capacity for the uptake and storage of bilirubin by this organ.

1776 EFFECT OF FREE AND CONJUGATED BILE SALTS ON α-AMYLASE ACTIVITY. *(E.)* O'Donnell, M. D.; McGeeney, K. F.; FitzGerald, O. (Dept. Med. Ther., Univ. Coll., Dublin, Ireland). *Enzyme* 19(4): 129-139, 1975.

The effect of individual bile salts on *in vitro* α-amylase hydrolysis of insoluble Cibachron Blue starch was studied at pH 6.0, the average pH in the jejunum. Control tubes contained 100 mM/liter phosphate buffer, 100 mM/liter NaCl, 1.0 mM/liter $CaCl_2$ diluted with water, and 200 mg of blue starch as substrate. Cholic acid, deoxycholic acid, chenodeoxycholic acid, and lithocholic acid were dissolved in NaOH, buffered, and added to the tubes. Stock solutions of the conjugated sodium cholate, taurocholate, taurodeoxycholate, and taurochenodeoxycholate were dissolved in water. With sodium cholate, taurocholate, and taurodeoxycholate, the enzyme activity in the tubes was increased to 150-160% of control values at a bile salt concentration of about 1 mM/liter. The increased activity extended up to 4 mM/liter. Sodium deoxycholate activated the amylase hydrolysis of the starch up to 0.75 mM/liter (150%) and inhibited it at about 2.5 mM/liter; a similar pattern was seen with taurochenodeoxycholate, which stimulated enzyme activity up to 0.25 mM/liter (135%) and inhibited it above 1.5 mM/liter. Chenodeoxycholate and lithocholate exerted marked inhibition at concentrations as low as 0.5 mM/liter, the inhibition of α-amylase by the former being competitive with both soluble and insoluble starch substrates. The data suggest that bile salts may play a central role in the digestion of carbohydrate, fat, and protein, contributing to the many interactions which occur between enzymes and substrates.

1777 METABOLISM AND BILIARY EXCRETION OF ETHACRYNIC ACID. *(E.)* Klaassen, C. D.; Fitzgerald, T. J. (Univ. Kansas Med. Cent., Kansas City). *J. Pharmacol. Exp. Ther.* 191(3):548-556, 1974.

The biliary excretion of ethacrynic acid (EA) was studied quantitatively and the chemical forms in which it is excreted into bile were determined. ^{14}C-Ethacrynic acid was given i.v. to male Sprague-Dawley rats (1 μCi) and male mongrel dogs (5 μCi). The metabolites of EA were separated by thin-layer chromatography. In rats within 4 hr after the i.v. administration (5 or 50 mg/kg) of ^{14}C-EA, 60-70% was excreted into the bile. Less than 25% was EA and the remainder was biotransformation products. Two major metabolites were identified: the glutathione adduct of EA and EA-mercapturate. Dogs excreted 57% of a 5 mg/kg dose into bile within 4 hrs. Less EA was metabolized by the dog than the rat; 38% of the radioactivity excreted into dog bile was in the form of EA. The dog formed a third metabolite, a cysteine adduct of EA. Seventeen percent of the ^{14}C excreted into the bile remained unidentified. It is suggested that EA is actively transported into the bile and that the unmetabolized EA would probably undergo an enterohepatic circulation, that the EA metabolites might be reconverted to the parent compound of digestive enzymes and by intestinal flora and then also undergo enterohepatic circulation.

1778 THE CHOLERETIC ACTION OF SODIUM TYROPANOATE (BILOPAQUE SODIUM) IN THE DOG: PRELIMINARY OBSERVATIONS. *(E.)* Nelson, J. A.; Staubus, A. E.; Amberg, J. R. (VA Hosp., San Francisco, Calif.). *Invest. Radiol.* 9(6):438-443, 1974.

Excretion studies on sodium tyropanoate were performed on 3 unanesthetized, trained, adult dogs (2 male, 1 female, 20-30 kg) with a modified Thomas cannula (inserted 18-28 months earlier) in the duodenum opposite the ampulla of Vater. Each experiment was preceded by a 1-2 hr control period, with sodium taurocholate given at a constant infusion rate of 8 μM/min. An average bile flow of 0.14 ml/kg/15 min was established as a baseline volume for these 3 dogs. Sodium tyropanoate solution was prepared to an osmolarity of 308 mOsm the resulting solution having a pH of 7.2. This contrast medium was given as an i.v. bolus at a dose of 50 mg/kg (identical to the dose of sodium iopanoate given to these same dogs in an earlier study). Bile volume was determined at 15-min intervals and the bile iodine concentration determined using the method of K-shell fluorescent activation analysis. Timed blood samples were also obtained and iodine concentration determined by fluorescent excitation analysis. One week later, each dog was similarly studied with an identical dose of sodium tyropanoate given as a bolus through a tube in the duodenal cannula into the proximal jejunum. The bile volume curves were similar for all 6 sodium tyropanoate experiments. When the data from the sodium tyropanoate experiments were compared with the data from earlier experiments using sodium iopanoate, the gross kinetics of the 2 drugs were found to be quite similar. Sodium tyropanoate, however, caused a choleresis that led to the excretion of a more dilute solution of contrast material in hepatic bile. Crossover studies, which were conducted with a 2-week interval, indicated that the choleresis was not related to any temporal changes in the animal preparation. The results of these experiments indicate that, while sodium tyropanoate and sodium iopanoate have similar cumulative bile excretion and blood curves, they differ in their effect on bile flow. This difference is reflected by the different concentrations of these 2 agents found in hepatic bile. These experiments do not explain why this difference occurs.

1779 PHARMACOLOGICAL REVERSAL OF CHOLESTASIS-ASSOCIATED DECREASE IN HEPATIC CYTOCHROME P-450.

(E.) Mackinnon, M.; Simon, F. (Univ. Colorado Med. Cent., Denver). *Biochem. Pharmacol.* 24(6):748-749, 1975.

The potential of the established microsomal-inducing agents, phenobarbital and 3-methylcholanthrene, for reversing the decrease in the components of the hepatic microsomal drug-metabolizing system associated with bile duct ligation and ethinyl estradiol treatment was studied. Cholestasis was produced in male Sprague-Dawley rats by double ligation and transection of the common bile duct or by the administration of ethinyl estradiol (5 mg/kg/day, i.m.). Phenobarbital (80 mg/kg/day) or 3-methylcholanthrene (15 mg/kg/day) was administered i.p. immediately after bile duct ligation or simultaneously with the 1st injection of ethinyl estradiol. Both bile duct ligation and ethinyl estradiol were associated with a significant decrease in the liver microsomal activities of cytochromes P-450 and b_5 and in NADPH cytochrome c reductase. Phenobarbital and 3-methylcholanthrene increased the level of cytochrome P-450, and only phenobarbital increased NADPH cytochrome c reductase. Simultaneous administration of phenobarbital and ethinyl estradiol slightly increased the level of cytochrome P-450, while simultaneous administration of ethinyl estradiol and 3-methylcholanthrene significantly lowered both cytochrome b_5 and reductase. These values did not differ significantly from those seen with ethinyl estradiol alone. When phenobarbital was administered for 3 days following bile duct ligation, the levels of all 3 components increased significantly over those seen after ligation alone. Bile duct ligation, ethinyl estradiol administration, and phenobarbital treatment were associated with a significant decrease in the specific activity of glucose 6-phosphatase. Simultaneous administration of phenobarbital and ethinyl estradiol lowered this activity below levels seen with either agent alone. Thus, the pharmacological reversal of the cholestasis-associated changes in microsomal proteins is specific, only those proteins stimulated by the pharmacological agent being affected.

1780 BILE ACID POOL SIZE IN HAMSTERS DURING GALLSTONE FORMATION AND AFTER CHOLECYSTECTOMY.

(E.) Bergman, F.; van der Linden, W. (Dep. Pathol.,I Univ. Umea, Sweden). *Z. Ernaehrungswiss.* 13(1/2):37-42, 1974.

To determine whether a decreased bile acid pool size in gallstone patients could be the chief causal factor in the production of lithogenic bile, the pool size was estimated in hamsters on lithogenic and antilithogenic diets before and after cholecystectomy. One group of hamsters was maintained on commercial chow or lithogenic diet 284 for 7-8 days prior to surgical cholecystectomy; another group was cholecystectomized and 10 days later was placed on the commercial or lithogenic diet for 7-8 days. In both the chow-fed and lithogenic diet-fed hamsters, there was a significant decrease in the size of the bile acid pool after cholecystectomy. Before cholecystectomy, the pool size in animals fed the gallstone-inducing diet was larger than that in the chow-fed controls; after cholecystectomy there was no clear difference. Chenodeoxycholic acid constituted a larger part of the pool in the hamsters fed the lithogenic diet than in the controls. The difference in the ratio between the cholic and chenodeoxycholic acid pools was not affected by cholecystectomy. The mean ratio of the pool sizes of the 2 primary bile acids was 1.33 in the animals fed the gallstone-inducing diet and 1.97 in the controls; this difference was statistically significant. The results question whether any pathogenic significance can be ascribed to the diminished bile acid pool found in gallstone patients.

1781 EFFECT OF DIETARY CONJUGATED BILE SALT SUPPLEMENTATION ON BILE ACIDS IN THE SMALL INTESTINE OF THE RAT. CHANGES IN APPARENT FATTY ACID ABSORPTION.

(Fr.) Demarne, Y.; Sacquet, E.; Van Heijenoort, Y.; Mathis, C. (Natl. Cent. Zootech. Res., Jouy-en-Josas, France). *Ann. Biol. Anim. Biochim. Biophys.* 14(2):239-250, 1974.

For 14 days, adult holoxenic rats were given a diet high in saturated fats (43% palmitic and stearic acids) which was supplemented with 5 parts/thousand of commercial sodium taurocholate. Experimental rats received an average of 123 μM/day bile salts (total 1720 μM). Extracts from the small intestines of experimental rats contained 88 μM bile acids in comparison to 48 μM in the control group. Cholic and deoxycholic acids accounted for 78% and 18%, resp., of bile acids in the controls and for 64% and 22%, resp., of bile acids in rats given the bile salt supplement. β-Muricholic acid was 14% lower and hyodeoxycholic acid 66% lower in experimental rats than in controls. Balance studies revealed that bile salt supplementation affected only lipid utilization. Stool samples contained 7.5% lipids in experimental rats and 15.0% in controls (dry weight). In rats given bile salt supplement, about 60% of the excreted lipids consisted of soluble lipids, while the soluble lipid fraction accounted for only 40% of total lipids in the stools of controls. Since both groups of rats excreted the same quantities of calcium, the high fecal excretion of insoluble lipids by controls cannot be due to decreased calcium utilization or increased excretion of endogenous calcium. Bile salt supplementation in holoxenic rats improved the utilization of long-chain, saturated fatty acids.

1782 PROLYL HYDROXYLASE ACTIVITY IN REGENERATING RAT LIVER. *(E.)* Benjamin, I. S.; Mcgee, J. O'D.; Than, T.; Rodger, M. C.; Blumgart, L. H. (Glasgow R. Infirm., Scotland). *Gut* 15(10): 829, 1974.

1783 STIMULATION OF IMMATURE MALE RAT LIVER GROWTH BY PHENOBARBITAL AND 3-METHYLCHOLANTHRENE. *(E.)* Augenlicht, L. H.; Argyris, T. S. (Dep. Biol., Syracuse Univ., N.Y.). *Exp. Mol. Pathol.* 22(1):1-10, 1975.

1784 EFFECTS OF γ-IRRADIATION OF BIOSYNTHESIS OF DIFFERENT TYPES OF RIBONUCLEIC ACIDS IN NORMAL AND REGENERATING RAT LIVER. *(E.)* Markov, G. G.; Dessev, G. N.; Russev, G. C.; Tsanev, R. G. (Inst. Biochem., Bulgarian Acad. Sci., Sofia). *Biochem. J.* 146(1):41-51, 1975.

1785 EFFECT OF PHENOBARBITAL ON LIVER CELL PROLIFERATION FOLLOWING PARTIAL HEPATECTOMY. *(Ger.)* Tuczek, H. V.; Skoruppa, W.; Rabes, H. M. (Pathol. Inst., Univ. Munich, Germany). *Verh. Dtsch. Ges. Pathol.* 54:437, 1973.

1786 BIOLOGICAL ASPECTS OF LIVER TRANSPLANTATION IN THE SWINE. *(Sp.)* Camprodon, R.; Salva, J. A.; Jornet, J.; Guerrero, J. A.; Monasterio, J.; Pineiro, H.; Mendoza, C. G.; Segura, J.; Soley, P.; Canela, M. (Francisco Franco Munic. Hosp., Barcelona, Spain). *Rev. Esp. Enferm. Apar. Dig.* 44(6):531-538, 1974.

1787 HETEROTOPIC AUXILIARY LIVER TRANSPLANTATION IN WISTAR RATS. *(Ger.)* Zelder, O.; Jerusalem, C. R.; Bode, C. (Surg. Clin., Univ. Marburg/Lahn, Germany). *Z. Gastroenterol.* 12(2):103-112, 1974.

1788 MASS ISOLATION AND CULTURE OF RAT KUPFFER CELLS. *(E.)* Munthe-Kaas, A. C.; Berg, T.; Seglen, P. O.; Seljelid, R. (Norsk Hydro's Inst. Cancer Res., Oslo, Norway). *J. Exp. Med.* 141(1):1-10, 1975.

1789 EXPERIMENTAL HEPATIC NECROSIS: MORPHOLOGIC, BIOCHEMICAL AND IMMUNOELECTROPHORETIC STUDIES. *(E.)* Zaki, F. G.; Keysser, C. H. (Squibb Inst. Med. Res., New Brunswick, N.J.). *Am. J. Pathol.* 78(1):11a, 1975.

1790 LASER SURGERY IN EXSANGUINATING LIVER INJURY. *(E.)* Fidler, J. P.; Hoefer, R. W.; Polanyi, T. G.; Bredemeier, H. C.; Siler, V. E.; Altemeier, W. A. (Univ. Cincinnati Med. Cent., Ohio). *Ann. Surg.* 181(1):74-80, 1975.

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1792 AUTORADIOGRAPHIC STUDIES OF RAT SPLEEN AFTER 2/3 HEPATECTOMY. *(Ger.)* Grouls, V.; Yamashita, K.; Helpap, B. (Pathol. Inst., Univ. Bonn, Germany). *Verh. Dtsch. Ges. Pathol.* 58:515, 1974.

1793 STUDIES ON PLASMA MEMBRANES. XXII. FATTY ACID PROFILES OF LIPID CLASSES IN PLASMA MEMBRANES OF RAT AND MOUSE LIVERS AND HEPATOMAS. *(E.)* Van Hoeven, R. P.; Emmelot, P.; Krol, J. H.; Oomen-Meulemans, E. P. M. (Netherlands Cancer Inst., Amsterdam). *Biochim. Biophys. Acta* 380(1):1-11, 1975.

1794 GANGLIOSIDES IN MITOCHONDRIA AND MICROSOMES OF RAT HEPATOMA 27 AND OF RAT LIVER. *(Rus.)* Diatlovitskaia, E. V.; Novikov, A. M.; Gorkova, N. P.; Sorokina, I. B.; Bergelson, L. D. (Shemiakin Inst. Bioorgan. Chem., Moscow, USSR). *Dokl. Akad. Nauk SSSR* 220(4):969-971, 1975.

1795 CYTOSTATIC, CYTOCIDAL AND POTENTIAL ANTITUMOR PROPERTIES OF A CLASS OF QUINOID COMPOUNDS, INITIATORS OF THE DORMANT STATE IN THE SPORES OF Agaricus bisporus. *(E.)* Vogel, F. S.; Kemper, L. A. K.; McGarry, S. J.; Graham, D. G. (Duke Univ. Med. Cent., Durham, N.C.). *Am. J. Pathol.* 78(1):33-48, 1975.

1796 RETICULOENDOTHELIAL FUNCTION AND ENDOTOXEMIA FOLLOWING HEPATIC ISCHEMIA IN THE PRIMATE. *(E.)* Holper, K.; Olcay, I.; Kitahama, A.; Trejo, R. A.; Miller, R.; Brettschneider, L.; Diluzio, N. R.; Drapanas, T. (Sch. Med., Tulane Univ., New Orleans, La.). *Eur. Surg. Res.* 6(1):53, 1974.

1797 THE EFFECTS OF PORTACAVAL SHUNTING AND PORTACAVAL TRANSPOSITION ON SERUM GAMMA-GLOBULIN LEVELS IN THE RAT. *(E.)* Benjamin, I. S.; Ryan, C. J.; McLay, A. L. C.; Horne, C. H. W.; Blumgart, L. H. (Glasgow R. Infirm., Scotland). *Gut* 15(10):825-826, 1974.

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1799 EFFECT OF THE DURATION OF LIGHT EXPOSURE AND TIME OF FEEDING ON CONTROL OF THE CIRCADIAN RHYTHM OF CHOLESTEROL-7α-HYDROXYLASE IN THE RAT. *(Fr.)* Van Cantfort, J. (Lab. Med. Chem., Univ. Liege, Belgium). *C. R. Acad. Sci.* [*D*] *(Paris)* 279:1273-1276, 1974.

1800 STIMULATION OF HEPATIC 3-HYDROXY-3-METHYLGLUTARYL CoA REDUCTASE ON ADMINISTRATION OF ATP. *(E.)* Rao, G. S.; George, R.; Ramasarma, T. (Dep. Biochem., Indian Inst. Sci., Bangalore). *Biochem. Biophys. Res. Commun.* 62(3):665-668, 1975.

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1814 CHANGES IN THE PARAMETERS OF MITOCHONDRIAL RESPIRATION AND THE CONTENTS OF SOME NUCLEOTIDES IN THE RAT HEPATOCYTE AFTER IN VIVO CONTAMINATION WITH PLUTONIUM (^{230}Pu) CITRATE. *(Fr.)* Pepin, G.; Pasquier, C.; Vallee, C.; Duprey, F.; Boudene, C. (Lab. Toxicol., Univ. Paris-Sud, Chatenay-Malabry, France). *C. R. Acad. Sci.* [*D*] *(Paris)* 280:141-144, 1975.

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1824 OPTICAL MEASUREMENT OF THE CATALASE-HYDROGEN PEROXIDE INTERMEDIATE (COMPOUND I) IN THE LIVER OF ANESTHETIZED RATS AND ITS IMPLICATION TO HYDROGEN PEROXIDE PRODUCTION IN SITU. *(E.)* Oshino, N.; Jamieson, D.; Sugano, T.; Chance, B. (Sch. Med., Univ. Pennsylvania, Philadelphia). *J. Biochem.* 146(1):67-77, 1975.

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1831 EFFECT OF ADMINISTRATION OF A COLONIC METABOLITE OF CHOLIC ACID ON CHOLESTEROL LEVELS IN BILE AND BLOOD. *(E.)* Pomare, E. W.; Low-Beer, T. S. (Bristol R. Infirm., England). *Gut* 15(10):830, 1974.

See also, 1603, 1612, 1613, 1652, 1683, 1688, 1841, 1851, 1871, 2202, 2206, 2348.

SECRETION AND METABOLISM

Intestine

1832 ENZYME HISTOCHEMICAL STUDY OF FAT ABSORPTION IN HUMAN DUODENAL MUCOSA. *(E.)* Monges, H.; Chamlian, A.; Cougard, A.; Mathieu, B. (North Hosp., Marseille, France). *Gut* 15(10):777-782, 1974.

In 7 healthy male subjects (30-62 yr) the activities of 10 intestinal enzymes were studied using a fasting control peroral biopsy and 2 other biopsies 15 and 30 min after an intestinal infusion of emulsified corn oil. The long chain fatty acids in the corn oil were distributed as 9% palmitic acid, 3% stearic acid, 46% oleic acid, 41% linoleic acid, and 1% arachidic acid. Four healthy subjects with a nutritional status identical to the tested subjects did not receive any fat and were submitted to 3 biopsies at 15-min intervals to detect if any enzymatic modification was induced by the biopsy tube. Histochemical methods were used to compare the enzymatic activities of the absorptive cells at the tips of the villi before and during fat absorption which was demonstrated with a Sudan black stain. Four of the 10 oxidative enzymes were modified by the corn oil infusion: NADH tetrazolium reductase, NADPH tetrazolium reductase, glucose-6-phosphate dehydrogenase (G-6-PD), and lactate dehydrogenase (LD). In 6 cases, the activity of NADH tetrazolium reductase was increased. Two of these subjects presented a simultaneous increase of NADPH tetrazolium reductase and G-6-PD; 2 other subjects presented a decrease in LD activity. These histochemical data indicate that after corn oil has been instilled into the lumen, conspicuous, enzymatic modifications occur in the absorptive cells at the tips of the duodenal villi when the fat absorption is important.

1833 ALKALINE PHOSPHATASES IN THE SMALL-INTESTINAL WALL OF THE RAT AFTER JEJUNO-ILEAL TRANSPOSITION. *(E.)* Gronqvist, B.; Lundqvist, G. (Univ. Hosp., Uppsala, Sweden). *Acta. Chir. Scand.* 140(8):643-648, 1974.

To further elucidate the ability of jejunum and ileum to retain their functions after transposition, the activity of alkaline phosphatases in the wall of the small intestine was studied. Fasted Sprague-Dawley rats were subjected to surgical jejuno-ileal transposition (transposed group); controls were sham-operated or left unoperated. Analyses of alkaline phosphatases in homogenates of intestinal tissue were performed 2, 6, and 12 weeks after surgery. Compared with the controls, the transposed animals showed a somewhat reduced weight gain. There was no appreciable difference in protein content/ml homogenate between controls and transposed rats. The activity of alkaline phosphatases in the intestinal segments studied contradicted the hypothesis that the enzyme activity of the transposed segments adapts completely to their new positions. The results indicate that with the exception of certain initial enzyme losses, each intestinal segment essentially retains its original enzyme activity after transposition and that the intestinal cells cannot be stimulated to above-normal enzyme activity by nutrition from small bowel contents.

1834 THE EFFECT OF DIFFERENT DIETS ON THE ALKALINE PHOSPHATASE, ADENOSINE TRIPHOSPHATASE (ATPase) AND DISACCHARIDASE LEVELS OF THE SMALL INTESTINE OF THE RAT. *(E.)* Hietanen, E. (Dep. Physiol., Univ. Turku, Finland). *Comp. Biochem. Physiol.* 50(1A):41-46, 1975.

The effects of conventional diets on the mucosal enzyme levels in the small intestine was studied using 4 groups of male Wistar rats. Pelleted diets from 3 different manufacturers were used; the pellets fed to groups I and II originated from the same manufacturer, but those fed to group II contained more vitamins, proteins, and fats. The data showed marked differences in the mucosal alkaline phosphatase, ATPase, and disaccharidase activities among the 4 groups after feeding on various pellets for 4 weeks. No significant changes had been detected after 2 weeks feeding. Groups I and II had very marked differences in the enzyme activities at 4 weeks. The weight gain and liver:body weight ratio, and hepatic and intestinal protein contents showed only minor variations, indicating that the dietary requirements of the rats were satisfied by each of the pelleted diets. The lactase activity varied most markedly in the small intestine of rats on different pelleted diets. Even maltase and trehalase activities had nearly significant differences from the control group after alteration of the pelleted diet. These data emphasize the fact that even minor changes in the content of pelleted diets and diets from various commercial manufacturers may induce marked changes in the mucosal enzyme levels. This might be one reason for the frequently discrepant results on mucosal enzyme levels found when comparing data from various laboratories. It is suggested that the source of the diet and its content should be noted, as even the slightest variations may be reflected in the mucosal metabolism. These results also support an earlier study which indicated that the adaptation of mucosal enzymes to a diet was not detectable at 2 weeks but was detectable after 4 weeks time.

1835 THE ACTIVITY OF INTESTINAL DISACCHARIDASES AND DIPEPTIDASES IN RATS WITH CHRONIC RENAL INSUFFICIENCY. *(E.)* Grimmel, K.; Bongartz, S.; Kasper, H. (Med. Univ., Wurzburg, Germany). *Acta Hepatogastroenterol. (Stuttg.).* 21(5):383-387, 1974.

The activity of intestinal disaccharidases and dipeptidases was studied in 18 male Wistar rats with chronic renal insufficiency (induced by 5/6-nephrectomy and subsequent resection with thermocautery). A sham operation was given to 19 controls. Homogenates from small intestinal mucosa were used to estimate the activities of the disaccharidases (lactase, cellobiase, saccharase and maltase) and the dipeptidases which hydrolyse the dipeptides L-leucyl-L-leucine, L-leucyl-L-proline, L-leucyl-glycine, glycyl-L-leucine, L-methionyl-L-leucine, L-methionyl-L-methionine and L-methionyl-L-proline. Only the mean saccharase activity was decreased in the nephrectomized uremic rats (65.4 IU/g protein) as compared to that in the controls (93.2 IU/g protein). The mean activity for the dipeptidases hydrolyzing L-leucyl-L-proline and L-methionyl-L-proline was significantly increased in the nephrectomized rats. Also the increase in activity of L-leucyl-L-proline dipeptidase correlated positively with severity of uremia (as indicated by increased blood urea-nitrogen values). Thus the authors have found a significant decrease in the saccharase activity of uremic rats and, in contrast to previous reports, no significant changes in the activities of lactase, cellobiase and maltase; on the other hand they have found significant increases in 2 dipeptidases.

1836 MULTIPLE FORMS OF PEPTIDE HYDROLASES FROM GUINEA-PIG INTESTINAL MUCOSA.

(E.) Piggott, C. O.; Fottrell, P. F. (Dep. Biochem., Univ. College, Galway, Ireland). *Biochem. Soc. Trans.* 2(6):1366-1368, 1974.

Beta peptide hydrolases from guinea pig mucosal homogenates were purified and characterized. For purification of β_1 and β_2 hydrolases, mucosal scrapings were homogenized in sodium borate buffer (pH 8.4) and the supernatant centrifuged. The enzyme activity was precipitated with solid $(NH_4)_2SO_4$ in borate buffer (pH 8.4) and dialyzed against this buffer. The dialyzed solution was applied to a DEAE cellulose column and chromatographed by a linear salt-gradient elution procedure. Fractions containing enzyme activity were pooled, concentrated and subjected to preparative polyacrylamide-gel electrophoresis. The β_1 and β_2 hydrolases had pH optima at pH 8.2 (which is different from that for α peptide hydrolase). Varying degrees of inhibition of the enzymes were observed with Co^{++}, Mn^{++}, Cu^{++} and Zn^{++}. There was no endopeptidase activity as measured with denatured cytochrome C and no activity was found with N-benzyloxycarbonly-Gly-L-Phe. The enzymes hydrolyzed a wide range of peptides and many of the peptide substrates were hydrolyzed by both. They were particularly active with glycine-containing dipeptides (in contrast with α peptide hydrolase). Although the β_1 and β_2 peptide hydrolases differed in their affinities for various peptides and had slightly different electrophoretic mobilities other similarities indicate they are closely related enzymes.

1837 ACID α-GLUCOSIDASE FROM HUMAN GASTROINTESTINAL MUCOSA -- SEPARATION AND CHARACTERIZATION.

(E.) Asp, N. G.; Gudmand-Hoyer, E.; Christiansen, P. M.; Dahlqvist, A. (Chem. Cent., Univ. Lund, Sweden). *Scand. J. Clin. Lab. Invest.* 33(3):239-245, 1974.

The separation and characterization of α-glucosidase, an intestinal maltase with an acid pH-optimum, is described and the extent that this enzyme contributes to the total maltase activity in crude mucosal homogenates from various parts of the human gastrointestinal tract at various pH was determined. Homogenates of mucosa from the stomach (corpus and antrum), the duodenum and the jejunum were used. The enzyme was separated using gel filtration chromatography on a Bio-Gel P-300 column. Maltase activity in the stomach was higher when measured at pH 4 than at pH 6. Also, maltase activity in the duodenum was optimum at pH 4-4.5, but in the jejunum it was optimum at pH 5.5-6. In homogenates from the stomach nearly all the fractions with maltase activity were soluble at both pH 4 and 6. In duodenal homogenates the major fraction of the activity was soluble only when measured at pH 4, and in jejunal homogenates fractions with most of the activity were insoluble. The activity of the separated acid α-glucosidase was maximal at pH 4.5 as tested on various substrates (isomaltose, maltose, p-nitrophenyl α-glucoside and amylose). The K_m values with the latter 3 substrates were approximately 10^{-2} M/liter, 3.5×10^{-3} M/liter and 5 mg/ml, resp., regardless of the source of enzyme. Maltose was hydrolyzed more rapidly than any of the other substrates tested. Turanose inhibited the enzyme activity, while sucrose did not. Thus this investigation has demonstrated that there is a soluble acid α-glucosidase in the human gastrointestinal mucosa that appears to be responsible for almost all of the maltase activity in normal gastric mucosa but contributes just a small percent to the overall maltase when the jejunum is included.

1838 AMINO ACIDS IN GUT CONTENTS AND BLOOD PLASMA OF RATS AS AFFECTED BY DIETARY AMINO ACID IMBALANCE.

(E.) Nasset, E. S.; Ju, J. S. (Dep. Nutr. Sci., Univ. California, Berkeley). *J. Nutr.* 105(1):69-79, 1975.

The effect of an amino acid imbalanced diet on amino acid homeostasis in blood plasma and gut contents in male Sprague-Dawley rats was studied. Six series of 13 rats were fed a stock diet and after 6 days blood and gut contents were obtained from one rat in each series and analyzed for amino acids. The remaining 12 rats in each series were divided into 2 equal groups and fed a control and an imbalanced diet. Both diets contained equal concentrations of casein (5%) that on complete hydrolysis would yield 48 g of amino acids/kg of diet. The imbalanced diet was produced by adding 56 g of essential amino acids to each kg of diet. Blood and gut contents were obtained from these rats on each day of the 6 day test and chromatographic columns were used for amino acid analysis. Ingestion of the imbalanced diet resulted in a rise in total plasma amino acids, while the initial response to the control diet was an immediate drop of total amino acids followed by a gradual rise. The change in total plasma amino acids for both diets was relatively small, but there were large differences among individual amino acids, some of which changed in opposite directions. Threonine exhibited the most striking changes: the gut content values rose to over 200% of the stock diet values and the plasma values increased to 320% at day 6 for the imbalanced diet. It was suggested that dietary amino acid imbalance affects amino acid homeostasis in ways not yet understood, but that certain unspecified amino acid interactions may be operative.

1839 INTESTINAL CALCIUM-BINDING PROTEIN IN ANIMALS FED NORMAL AND RACHITOGENIC DIETS: II. PIG STUDIES.

(E.) Harrison, J. E.; Hitchman, A. J. W.; Brown, R. G. (Dep. Med., Univ. Toronto, Canada). *Can. J. Physiol. Pharmacol.* 53(1):144-149, 1975.

The relationship between intestinal concentrations of calcium-binding protein and the presence of rickets was studied in pigs. For 6 weeks before breeding, throughout gestation, and throughout the 4-week nursing period, a sow was maintained on a standard diet minus vitamin D; the sow was kept in an area free of ultraviolet light. Six of the weanling pigs were placed for 5 months on the same vitamin D-deficient diet; half the litter was given a single i.m. dose of vitamin D_2 (500,000 IU) 3 days before slaughter. The duodenal mucosa from all pigs was examined for calcium-binding protein and the results compared with those from control pigs fed the standard diet with usual vitamin-D supplements. In a 2nd experiment, weanling pigs from a sow fed a normal diet were maintained for 12 weeks on a vitamin D-deficient, calcium-deficient, low-phosphate diet; 1/2 the litter was injected i.m. with vitamin D_2 (1,000,000 IU) 72 hr before slaughter. In the 1st experiment, the pigs fed the vitamin D-deficient diet showed neither biochemical nor radiological evidence of rickets. Calcium-binding protein was present in the duodenal mucosa but to a lesser extent than in the controls; vitamin D_2 injection before death increased the calcium-binding protein concentration by a factor of 2. In the 2nd experiment, the pigs fed the low-phosphate, calcium-deficient, vitamin D-deficient diet were underweight and showed clinical and histological signs of rickets. Serum calcium and serum phosphorus values were below normal, but calcium-binding protein was present in normal concentrations in the duodenal mucosa. Calcium-binding protein and serum calcium and phosphorus levels were unaffected by vitamin D_2 injection before death. The vitamin D levels in the livers of the rachitic pigs were less than 1/20 those in control animals. The data indicate that intestinal calcium-binding protein concentrations cannot be used as a reliable indication of the presence or absence of rickets.

1840 ACTIVE SECRETION OF CALCIUM, SODIUM AND CHLORIDE BY ADULT RAT DUODENUM IN VITRO.

(E.) Walling, M. W.; Kimberg, D. V. (Harvard Med. Sch., Boston, Mass.). *Biochim. Biophys. Acta* 382(3): 213-217, 1975.

Active Ca^{2+} secretion across proximal rat duodenum was studied at Ca^{2+} concentrations which should saturate unidirectional mucosal to serosal flux but not serosal to mucosal flux. Ion fluxes were studied *in vitro* with a modified Ussing apparatus using duodenums from adult male Holtzmann rats. The tissues were perfused with media containing 25 mM $CaCl_2$; control media contained similar concentrations of Cl^- and were of similar osmolarity. Calcium and Na^+ fluxes were measured simultaneously using $^{45}Ca^{2+}$ and $^{22}Na^+$ as tracers. While there was no net Ca^{2+} flux across the duodenum when the medium Ca^{2+} concentration was 1.25 mM, there was a large active secretion of Ca^{2+} when the level was raised to 25 mM. With the latter concentration, unidirectional mucosal to serosal flux was increased only by a factor of 10, while serosal to mucosal flux increased in proportion to the change in Ca^{2+} concentration. Active Na^+ secretion was of similar magnitude at both Ca^{2+} concentrations. Both unidirectional Na^+ fluxes and intestinal conductance were decreased at 25 mM Ca^{2+}. Cellular metabolism and some intracellular transport processes were apparently unaffected. When Na^+, Ca^{2+}, and Cl^- fluxes were measured simultaneously across stripped rat duodenum under conditions with no co-transportable substrate (hexose or amino acid) in the mucosal solution, active secretion of Cl^- and Na^+ was observed, along with a small absorption of Ca^{2+}. The sum of Na^+ and Cl^- fluxes did not account for the entire short-circuit current measured. Bicarbonate ion secretion may account for the residual ion flux. The results support the hypothesis that the polarity of net Na^+ and Cl^- fluxes changes from secretion to absorption between the proximal and distal small bowel.

1841 A STUDY OF THE CYTOPLASMIC RECEPTORS FOR GLUCOCORTICOIDS IN INTESTINE OF PRE- AND POSTWEANLING RATS.

(E.) Henning, S. J.; Ballard, P. L.; Kretchmer, N. (Dep. Pediatr., Stanford Univ., Calif.). *J. Biol. Chem.* 250(6):2073-2079, 1975.

To determine the mechanism of glucocorticoid-induced enzymic and morphologic changes in the rat intestine during weaning, the cytoplasmic fraction of 18-day-old rat intestines was examined for specific glucocorticoid-binding proteins. Incubation of intestinal slices from Wistar rats with (^{3}H)dexamethasone in a physiological medium at 2 C showed the presence of a cytoplasmic binding macromolecule with high specificity for steroids having glucocorticoid activity. The binding reaction was saturable and of high affinity. Binding was reversible on addition of nonlabeled dexamethasone, indicating that the usual assay procedure measured both corticosterone-filled and unoccupied binding sites. Sucrose density gradient centrifugation indicated that the receptor-dexamethasone complex from intestinal cytosol sedimented at the same rate as that from liver (8.2 sedimentation coefficient). The receptor-dexamethasone complex was stable at 2 C for at least 24 hr in intestinal slices, but in isolated cytosol fractions there was a considerable loss of binding even in the presence of high concentrations of (^{3}H)dexamethasone. The presence of cytosol from intestinal mucosa, but not that from muscle layers, caused a dissociation of dexamethasone from liver cytosol receptors, suggesting the presence of some interfering factor in isolated mucosal cytosol. The instability of steroid-receptor complexes in the presence of isolated intestinal cytosol seems to be associated with homogenization, thus having no physiological significance. Receptor activity was present in the intestine from late fetal life through adulthood, but the concentrations were significantly higher during the first 2 weeks after birth than at all other times. In contrast, receptor activity in rat lung cytosol was high at the time of birth, while that in the liver rose steadily during the 1st postnatal week and remained at high levels thereafter. Thus, specific receptors for glucocorticoids are present in the rat intestine during periods of responsiveness and unresponsiveness. This suggests that although corticosteroids exert their effects through the cytoplasmic receptors, this early event in glucocorticoid action may not be a controlling step for changes in responsiveness during development.

1842 CELLULAR LOCALIZATION OF A VASOACTIVE INTESTINAL PEPTIDE IN THE MAMMALIAN AND AVIAN GASTROINTESTINAL TRACT.

(E.) Polak, J. M.; Pearse, A. G. E.; Garaud, J. C.; Bloom, S. R. (R. Postgrad. Med. Sch., Hammersmith Hosp., London, England). *Gut* 15(9):720-724, 1974.

A series of immunofluorescence-based studies investigated the localization of vasoactive intestinal polypeptide in the mammalian (2 mongrel dogs, 1 pig, and 1 baboon) and avian (30 Japanese quail) gastrointestinal mucosa. An antiserum to a pure porcine vasoactive intestinal polypeptide, possessing no cross reactivity against the related hormones glucagon, secretin, and gastrin-inhibitory peptide, revealed a wide distribution of vasoactive intestinal polypeptide cells throughout the entire length of the mammalian and avian gut. In the mammalian gastrointestinal tract, satisfactory results were obtained only in the freeze-dried and diethylpyrocarbonate vapor-fixed preparations incubated in the presence of trasylol. The highest numbers of vasoactive intestinal polypeptide cells were found in the large intestine of all 3 mammalian species and also in the body of the stomach in both the pig and baboon. In the avian gastrointestinal tract, good results were obtained with all 3 preparative techniques: (1) methanol-free formaldehyde, paraffin embedding; 2) 10% carbodiimide, cryostat sections; and 3) diethylpyrocarbonate, but these preparations were always superior. Vasoactive intestinal polypeptide cells were present in all regions except the gizzard. There were only 2 endocrine cell types that could be identified by electron microscopy in the avian gut and these were correlated with the argentaffin and argyrophil varieties on light microscopy. Sequential immunofluorescence and silver staining, showed that all the vasoactive intestinal polypeptide cells in the avian gastrointestinal tract belonged to the argyrophil variety. On electron microscopy, 3 types of endocrine cells in the mammalian gut were sufficiently widely distributed to be considered as the sites for production of vasoactive intestinal polypeptide: 1) enterochromaffin cells; 2) enteroglucagon cells; and 3) D cells. Serial section immunofluorescence for enteroglucagon and vasoactive intestinal polypeptide in mammalian gut samples indicated that the 2 cells were not identical and that each was differently localized in the mucosa. The finding that the avian vasoactive intestinal polypeptide cell is not the argentaffin enterochromaffin cell can perhaps be extrapolated to mammalian gut. These results suggest the D cell of the Wiesbaden classification as the most likely site for the production of vasoactive intestinal polypeptide. The final identification cannot be made, however, until a suitable preparative technique which allows the peptide to be demonstrated immunologically in resin-embedded semi-thin sections has been developed.

1843 THE AUTONOMIC CONTROL OF COLONIC MUCIN SECRETION IN THE MOUSE.

(E.) Smith, B.; Butler, M. (St. Bartholomew's Hosp., London, England). *Br. J. Exp. Pathol.* 55(6):615-621, 1974.

The autonomic control of the synthesis and secretion of colonic mucin was studied in male Porton mice. Some animals received drugs p.o. and others i.p. in a wide range of doses in both short- and long-term experiments. Carbachol was used as a parasympathetic stimulator, atropine as a parasympathetic blocker, norepinephrine as an α-adrenergic stimulator, guanethidine as an α-adrenergic blocker, isoprenaline as a β-adrenergic stimulator, and propanolol as a β-adrenergic blocker. All tissues were fixed for 24 hr in 10% formol saline and blocks taken from the proximal and distal colon. Paraffin sections were stained with periodic acid/Schiff, alcian blue and high iron diamine to show the degree of acidity and sulfation of the mucins. The amount of sulfomucin was greatest in the distal colon and rectum and decreased proximally towards the cecum. There was an unbroken layer of sialomucin covering the epithelium of the lumen and the crypts. It could be seen in the lumen both loose and surrounding any foreign material there with a thick layer. Sulfomucin also was released in large masses to lie in the lumen or against the wall. A sialomucin protected the mucosa so that even full thickness trauma initiated no inflammatory response. Carbachol produced considerable epithelial shedding, resulting eventually in large mucosal deficiencies, but the mucin layer remained intact and there was no ulceration or inflammatory reaction. β-Adrenergic stimulating drugs produced increased mucin synthesis and secretion, swelling of epithelial cells and inflammatory infiltration of the mucosa with retention of cellular debris and polymorphs in the crypts. β-Adrenergic blocking agents produced hemorrhage and inflammation acutely, and in the long-term, shortening and thickening of the muscle coats probably due to ischemia. These findings suggest that the β-adrenergic system has more important effects on the structure and function of colonic mucosa than the cholinergic system.

1844 ACIDIFICATION IN THE RAT PROXIMAL JEJUNUM.

(E.) Blair, J. A.; Lucas, M. L.; Matty, A. J. (Dep. Chem., Univ. Aston, Birmingham, England). *J. Physiol. (Lond.)* 245(2):333-350, 1975.

The cause of acidification in the rat proximal jejunum was investigated using the everted sac technique to measure the production of H^+. Jejunal sacs were taken from fasted male Wistar rats. Acidification was measured in phosphate buffer in closed and open systems; in some cases, the incubation flasks were left to stand in ice water before or after incubation. Acidification occurred in the absence of glucose, but increased on the addition of glucose to reach maximal values. An apparent K_m of 1.78 mM was derived for the glucose-dependent process. Acidification in the presence of glucose was inhibited by 10 mM of 2,4-dinitrophenol, phlorrhizin, aminophylline, or anaerobiosis. Histamine, EDTA, ouabain, and acetazolamide, compounds which are known to alter acid production in the gastric mucosa, had no effect on jejunal acidification. The unmetabolizable sugars, galactose and 3-O-methylglucose, also failed to increase acidification, while the metabolizable sugars mannose and fructose did lead to increases. Serosal and mucosal lactate production were measured and the calculated percentage of hydrogen ions possibly derived from this source was shown to account for only a small percentage of the acidification. The greatest increase in acidification with minimal simultaneous production of lactate occurred on the addition of ATP to the incubation medium, which did not enter the intestinal tissues. The data indicate that acidification is caused by hydrolysis at the mucosal surface of ATP derived from intracellular metabolic sources. The acid microclimate postulated to exist at the surface of the jejunal mucosa could be created by an aqueous phase at the mucosal surface not in equilibrium with the bulk phase, a source of hydrogen ions at the mucosal surface and slow diffusion of such ions within this phase. A microclimate with replenishment of hydrogen ions from jejunal surface acidification could affect the rate of transfer of weak acids and should be reconsidered as a way in which weakly ionizing substances are transferred.

1845 THE IN VIVO METABOLISM OF CHOLESTEROL BY GUT BACTERIA IN THE RAT AND GUINEA-PIG.

(E.) Goddard, P.; Hill, M. J. (Cent. Public Health Lab., London, England). *J. Steroid Biochem.* 5(7): 569-572, 1974.

The metabolism and excretion of [C_4-^{14}C]cholesterol was studied in 7 Sprague-Dawley rats and 5 guinea pigs. Cholesterol was injected into the proximal cecum of anesthetized animals under direct surgical vision, the incision was closed, and urine and feces were collected for 72 hr and chromatographically and spectrophotometrically analyzed for radioactive metabolites. About 88% of the total radioactivity was recovered in the fecal neutral steroid fraction of rats and guinea pigs; only 0.3 and 1.7%, resp., was recovered from urine. Analysis of the neutral steroid fraction showed that the major metabolite was 5β-cholestan-3β-ol (coprostanol), accounting for 57.3% and 69% of the total radioactivity in rats and guinea pigs, resp. Rat and guinea pig feces also contained small amounts of 4-cholesten-3-one (5.7% and 4.3%, resp.); rat but not guinea pig feces also contained 5β-cholestan-3-one (capostanone, 2.0%). Unmetabolized cholesterol comprised 35 and 26.7% of the fecal neutral steroid fraction in rats and guinea pigs, resp. Acid steroids (lithocholic and isolithocholic acid) made up 6.3% of the rat fecal cholesterol metabolites but were not excreted by guinea pigs. ^{14}C-estradiol and estrone, identified in the urine of guinea pigs, were reduced 5-fold by pretreatment of animals with antibiotics. Negligible amounts of ^{14}C were recovered in blood and bile and about 0.5% of the total dose was found in guinea pigs 24 hr after cholesterol instillation. Since previous studies have shown that cholesterol is poorly absorbed from the large bowel and only a small fraction of serum cholesterol is converted to urinary estrogens or to acid steroids, it was concluded that cholesterol is metabolized by the gut flora. The cholesterol side chain is completely removed in the guinea pig whereas only a 3-carbon unit is removed in the rat.

1846 COMPARISON OF SECRETORY AND HISTOLOGICAL EFFECTS OF SHIGELLA AND CHOLERA ENTEROTOXINS IN RABBIT JEJUNUM.

(E.) Steinberg, S. E.; Banwell, J. G.; Yardley, J. H.; Keusch, G. T.; Hendrix, T. R. (John Hopkins Univ. Sch. Med., Baltimore, Md.). *Gastroenterology* 68(2):309-317, 1975.

The secretory responses to maximal doses of shigella toxin or cholera toxin were studied to determine if mucosal damage is a prerequisite for toxin-induced secretion. Two 15-20 cm segments of proximal jejunum from male New Zealand rabbits (2-3 kg) were isolated and cannulated. The toxin solutions contained either shigella enterotoxin in concentrations ranging from 10-650 μg/ml or cholera enterotoxin in a concentration of 0.5 g of a freeze dried culture preparation mixed with 40 ml of distilled water. Shigella toxin levels of 200 μg/ml and above resulted in consistent secretion, but a concentration above 200 μg/ml did not further increase secretion. Significant fluid production occurred only after 105 min exposure. The maximum rate of secretion produced by shigella toxin was identical to that observed with cholera toxin. The secretory effect of the toxins were not additive. Epithelial alterations were observed in postperfusion biopsies, but the changes were not significant compared with controls, suggesting an effect from perfusion rather than from the toxins. Only minimal inflammation was observed. It is concluded that both shigella and cholera toxin induce secretion in the absence of histological changes.

1847 ADENYLATE CYCLASE IN INTESTINAL CRYPT AND VILLUS CELLS: STIMULATION BY CHOLERA ENTEROTOXIN AND PROSTAGLANDIN E_1.

(E.) Schwartz, C. J.; Kimberg, D. V.; Ware, P. (Harvard Med. Sch., Boston, Mass.). *Gastroenterology* 68(1):94-104, 1975.

The adenylate cyclase activities of villus and crypt epithelial cells were compared under basal conditions and after stimulation by fluoride, cholera enterotoxin, and prostaglandin E_1 (PGE_1). Mucosal fractions were prepared from the ileum of New Zealand male white rabbits with a planning technique and from the distal small intestine of albino male Sherman rats by a vibration technique. Incubations were initiated by adding 20 μl of homogenate containing approximately 200 μg of protein to 30 μl of medium. The final reaction mixture consisted of 50 mM Tris-HCl buffer at pH 7.5, 5 mM $MgCl_2$, 10 mM caffeine, 0.2mM ATP, 1 μCi of [8-^{14}C]ATP, and an ATP-regenerating system consisting of 10 mM phosphoenolypyruvate and 12.5 μg of pyruvate kinase. Incubations were performed for 5 min at 37 C. Just prior to termination of the reaction, 0.2 ml of a solution containing 60 μg of cyclic AMP and 0.25 μCi of cyclic [^{3}H]AMP was added to each tube. The incubation medium was then passed over a 0.5 x 3.0 cm column containing Dowex 50 W-X4 resin. Basal activity, as well as that stimulated by 10 mM NaF, was assessed in fractions from both control and cholera enterotoxin-exposed rabbit loops. Basal, NaF, and PGE_1-stimulated activities were measured in fractions obtained from rat intestine. In both species, base line adenylate cyclase activity was greater in crypt than in villus cells. After exposure to cholera enterotoxin *in vivo*, adenylate cyclase activity was enhanced 2-7 times in all fractions prepared from rabbit ileum, and the response was most marked in villus cells. Adenylate cyclase in membranes prepared from both rat villus and crypt intestinal cells was consistently doubled over the base line activity by the *in vitro* addition of PGE_1; NaF led to a 5- to 7-fold increase. These results indicate that both villus and crypt cells contain one of the important components required for the cyclic AMP-mediated secretory response, namely, a cholera enterotoxin and PGE_1-sensitivity adenylate cyclase activity. Since an increased level of cyclic AMP alone may not be sufficient to evoke a secretory response, it is concluded that these studies do not clarify the extent to which each of these major cell types may participate in cyclic AMP-mediated secretion.

1848 THE RESPONSE OF SMALL INTESTINAL VILLOUS AND CRYPT EPITHELIUM TO CHOLERATOXIN IN RAT AND GUINEA PIG. EVIDENCE AGAINST A SPECIFIC ROLE OF THE CRYPT CELLS IN CHOLERAGEN-INDUCED SECRETION. *(E.)* De Jonge, H. R. (Dep. Biochem., Erasmus Univ., Rotterdam, Netherlands). *Biochim. Biophys. Acta* 381(1):128-143, 1975.

Kinetic properties of adenylate cyclase in separately isolated upper villous and crypt cells from rat and guinea pig small intestine were compared to determine the relative contribution of villous and crypt epithelium to the choleragen-induced secretion *in vivo*. An apparent K_m of 0.4 mM was found for both enzymes in the rat. The V-values measured in the fluoride-stimulated state indicated an approximately equal enzyme content of both cell populations as opposed to a preferential localization in the brush border region of the epithelial cell. Adenylate cyclase was irreversibly activated in both villous and crypt compartments by prolonged contact of the small intestine with luminally administered choleragen. The maximal stimulation of the upper villous enzyme (4-7 times) exceeded the maximal effect on the crypt enzyme by 2-fold. A lag phase of at least 30 min was noted between the first luminal contact with the purified choleragen and a significant activation of the adenylate cyclase associated with isolated intestinal brush borders from the upper villous region. Adenylate cyclase activity in the upper villus could be optimally stimulated in the absence of any alteration of crypt cell activity by using a short exposure time (2 min) of the luminal surface to high amounts of choleragen. By comparing, *in vivo*, the effects of short and prolonged contact with cholera toxin on the unidirectional and net flux of ions and water in ileal and jejunal segments, it was concluded that both villous and crypt regions contribute to the secretion of water and electrolytes (Na^+, Cl^-, and HCO_3^-) during cholera. The serosal to mucosal flux of Na^+ and Cl^- increased without a significant alteration of the opposite flux. These results indicate that absorptive and secretory processes occur within the same epithelial compartment. The results of this study support the view that the crypt epithelium fulfills a specific role during the choleragen-induced secretion of ions and water.

1849 INTESTINAL METABOLISM OF PHENACETIN IN THE RAT: EFFECT OF CHARCOAL-BROILED BEEF AND RAT CHOW. *(E.)* Pantuck, E. J.; Hsiao, K. C.; Kuntzman, R.; Conney, A. H. (Coll. Physicians Surg., Columbia Univ., New York, N.Y.). *Science* 187:744-746, 1975.

The effects of charcoal-broiled ground beef and of rat chow diet on the metabolism of phenacetin were studied in the intestine of male Long-Evans rats. The proximal 5 cm segment of the small intestine was used to determine phenacetin O-dealkylation. The amount of *N*-acetyl-*p*-aminophenol (μg/5 cm intestine/90 min) in the tissue plus incubation solution represented the metabolism of phenacetin. A semisynthetic diet resulted in a mean value of 1.35; ground beef (cooked on foil), 1.97; ground beef (raw), 2.77; rat chow, 5.99; ground beef (charcoal-broiled), 15.88. The results indicate that charcoal broiled beef and a lab chow diet stimulate the intestinal metabolism of phenacetin in the rat. It is suggested that there is a need for studies in man to determine whether charcoal-broiled meat and other dietary constituents can stimulate the intestinal metabolism of phenacetin or other drugs and thereby decrease their absorption and bioavailability.

1850 EFFECTS OF LACTULOSE AND OTHER LAXATIVES ON ILEAL AND COLONIC pH AS MEASURED BY A RADIOTELEMETRY DEVICE. *(E.)* Bown, R. L.; Gibson, J. A.; Sladen, G. E.; Hicks, B.; Dawson, A. M. (St. Bartholomew's Hosp., London, England). *Gut* 15(12):999-1004, 1974.

The effect of lactulose on luminal pH in the ileum and colon of normal subjects and patients without gastrointestinal disease was compared with that of 2 other laxative agents, magnesium sulphate and sodium sulphate. A pH-sensitive radiotelemetry capsule was swallowed by each subject and luminal pH values were recorded every hr after giving the laxative. The agents and dose ranges were: lactulose syrup (80-110 M/day), magnesium sulphate mixture (22-23 M magnesium salt/day), sodium sulphate solution (25-37.5 M day), and a mixture of 10 ml lactulose and 15 ml sodium sulphate solution (3 times/day). Lactulose induced a highly significant fall in pH in the right colon, and magnesium sulphate induced a significantly elevated rectal pH; also, pH values were significantly higher along the gastrointestinal tract in the magnesium sulphate group. Sodium sulphate significantly lowered the pH in the left colon and rectum compared with controls, but only in the rectum compared with those given lactulose. The mixture of lactulose and sodium sulphate lowered the pH in the right colon and rectum compared with controls, but showed no significant difference when compared to the pH values induced by lactulose alone. Thus, lactulose produced consistent and marked acidification of proximal colonic contents, but changes in the rest of the colon were less consistent. If acidification of proximal colonic contents is considered beneficial in patients with chronic hepatic encephalopathy, these studies suggest that lactulose would be more effective than sodium sulphate, and that the combination of the 2 laxatives is unlikely to be more effective than lactulose alone.

1851 RADIOIMMUNOASSAY OF CHOLECYSTOKININ-PANCREOZYMIN. *(E.)* Harvey, R. F.; Dowsett, L.; Hartog, M.; Read, A. E. (Bristol R. Infirm., England). *Gut* 15(9):690-699, 1974.

A sensitive and specific radioimmunoassay was developed for cholecystokinin-pancreozymin (CCK-PZ) using rabbit antisera to crude porcine hormone. Highly purified porcine CCK-PZ, labeled with ^{131}I, and repurified by column chromatography on Sephadex G15, was used as tracer. Separation of free from antibody-bound labeled CCK-PZ was carried out using charcoal, ion-exchange resin, or a double antibody procedure. Non-specific interference with the assay system by serum factors was abolished by boiling and diluting the serum samples before assay. Ninety-nine % pure porcine CCK-PZ (standard), commercial CCK-PZ preparations, cerulein, the C-terminal 8- and 12-amino acid fragments of the CCK-PZ molecule, and endogenous human CCK-PZ all cross reacted in the assay system and showed parallel inhibition curves. No significant cross reaction was found with gastrin, secretin, glucagon, or insulin. The sensitivity of the assay is approximately 5 pg/ml of test solution, which proved adequate for measuring physiological levels of CCK-PZ in peripheral blood in man. Serum samples were obtained from 30 healthy volunteers (20-40 yr-old) after an overnight fast, and from 20 patients (40-75 yr-old) without upper gastrointestinal disorders. The mean immunoreactive CCK-PZ concentration in these 50 subjects was 60.4 pg/ml. The distribution of individual values was skewed, however, so that the median was much lower (30 pg/ml). Older subjects had higher fasting levels of CCK-PZ than the young adults. The lack of suitably characterized reference standards for either porcine or human CCK-PZ makes it difficult to compare the results of different assays or to determine with certainty the levels of endogenous human CCK-PZ. Even so, if properly selected control groups are used, it is suggested that the measurement of differences in CCK-PZ during physiological studies should be perfectly acceptable until well-characterized and stable standard preparations become available.

1852 STIMULATORY EFFECT OF A BRUSSELS SPROUTS OR CABBAGE DIET ON INTESTINAL DRUG METABOLISM IN THE RAT. *(E.)* Hsiao, K. C.; Pantuck, E. J.; Wattenberg, L. W.; Kuntzman, R.; Jacobson, M.; Conney, A. H. (Coll. Physicians Surg., Columbia Univ., New York, N.Y.). *Fed. Proc.* 34(3):742, 1975.

1853 LACK OF DIETARY ADAPTATION OF INTESTINAL 2-MONOGLYCERIDE ACYL TRANSFERASE. *(E.)* Rao, G. A.; Abraham, S. (VA Hosp., Martinez, Calif.). *Lipids* 9(11):940-942, 1974.

1854 FOOD-INDUCED CHANGES IN A DUODENAL FACTOR CONTROLLING THE INSULIN RESPONSE. *(Fr.)* Zermatten, A.; Felber, J. P. (Canton. Hosp., Univ. Lausanne, Switzerland). *Experientia* 30(6):648, 1974.

1855 THE EFFECT OF RAW SOYA BEAN ON IN VITRO ACTIVE AND PASSIVE ACCUMULATION BY RAT SMALL INTESTINE. *(E.)* Pope, H. O.; Patten, J. R.; Lawrence, A. L. (Univ. Texas Dent. Branch, Houston). *Br. J. Nutr.* 33(2):117-125, 1975.

1856 CALORIC INTAKE AND WEIGHT REGULATION IN WEANLING RATS WITH DORSOMEDIAL HYPOTHALAMIC LESIONS (DMNL). *(E.)* Bernardis, L. L.; Border, J. R. (Dep. Surg., State Univ. New York, Buffalo). *Fed. Proc.* 34(3):935, 1975.

1857 CONTROL OF FOOD INTAKE IN LEAN AND OBESE PIGLETS. *(E.)* Wangsness, P. J.; Gobble, J. L. (no affil.). *Fed. Proc.* 34(3):935, 1975.

1858 OBSERVATIONS OF PLASMA SECRETIN AND GASTRIN RESPONSES TO A MEAT MEAL AND DUODENAL ACIDIFICATION IN DOGS. *(E.)* Lee, K. Y.; Tai, H. H.; Chey, W. Y. (Genesee Hosp., Rochester, N.Y.). *Fed. Proc.* 34(3):441, 1975.

1859 INTERACTION OF DIETARY FAT AND INOSITOL ON PHOSPHOLIPID AND PHOSPHATIDYLINOSITOL METABILISM IN THE GUT OF THE GERBIL. *(E.)* Woods, M. N. (Harvard Sch. Public Health, Boston, Mass.). *Fed. Proc.* 34(3):932, 1975.

1860 POSTNATAL CHANGES IN LACTASE ACTIVITY IN THE INTESTINE OF TWO BREEDS OF PIGS. *(E.)* Ekstrom, K. E.; Grummer, R. H. (no affil.). *Fed. Proc.* 34(3):935, 1975.

1861 THE MECHANISMS OF ACID DISPOSAL BY RABBIT DUODENAL MUCOSA. *(E.)* Fiddian-Green, R. G.; Silen, W. (no affil.). *S. Afr. J. Surg.* 12(2):80, 1974.

1862 EFFECT OF LYSOLECITHIN ON IN VITRO BINDING OF RIBOSOMES TO MEMBRANES OF ROUGH ENDOPLASMIC RETICULUM (RER) OF RAT INTESTINAL MUCOSA. *(E.)* Yousef, I. M.; Kuksis, A. (no affil.). *Fed. Proc.* 34(3):916, 1975.

1863 CHOLECYSTOKININ ACTIVITY IN THE RAT SMALL INTESTINE. *(E.)* Schneeman, B. O. (Bruce Lyon Res. Lab., Oakland, Calif.). *Fed. Proc.* 34(3): 454, 1975.

1864 STUDIES ON THE NATURE OF CHOLECYSTOKININ-PANCREOZYMIN IN SMALL-INTESTINE MUCOSAL EXTRACTS. *(E.)* Harvey, R. F.; Dowsett, L.; Read, A. E. (Briston R. Infirm., England). *Gut* 15(10): 838-839, 1974.

1865 THE INFLUENCE OF ETHACRYNIC ACID AND ASPIRIN ON WATER AND ELECTROLYTE SECRETION INDUCED BY PROSTAGLANDIN E_1 IN THE HUMAN JEJUNUM. *(E.)* Matuchansky, C.; Mary, J. Y.; Rambaud, J. C.; Bernier, J. J. (INSERM, St. Lazare Hosp., Paris, France). *Gut* 15(10):831, 1974.

1866 THE CONTENT OF VITAMIN A FRACTIONS AND RETINYL-PALMITATE HYDROLASE ACTIVITY IN THE SMALL INTESTINE MUCOSA AND ITS CELL MEMBRANES IN VITAMIN A DEFICIENCY AND RADIATION EXPOSURE. *(Rus.)* Leutskii, K. M.; Liubovich, E. N.; Sovtysik, D. D. (Chernovtsy State Univ., USSR). *Dokl. Akad. Nauk SSSR* 220(4):972-974, 1975.

1867 NUCLEAR 1α,25-DIHYDROXYVITAMIN D_3 RECEPTORS IN INTESTINE. *(E.)* Brumbaugh, P. F.; Haussler, M. P. (Arizona Med. Cent., Tucson). *Fed. Proc.* 34(3):887, 1975.

1868 COMPARISON OF HISTOCHEMICAL AND DISC ELECTROPHORESIS FINDINGS ON POSTNATAL DIFFERENTIATION OF ENZYMES IN THE INTESTINAL MUCOSA. *(Ger.)* Hohn, P.; Schafer, A.; Paasch, W.; Gabbert, H. (Pathol. Inst., Univ. Mainz, Germany). *Verh. Dtsch. Ges. Pathol.* 57:444, 1973.

1869 THE PRODUCTION OF LYSOZYME BY THE PANETH CELL. *(E.)* Vantrappen, G. R.; Peters, T. L. (no affil.). *Gut* 15(10):826-827, 1974.

1870 MORPHOLOGICAL FINDINGS ON THE ROLE OF GRANULE-CONTAINING PANETH CELLS IN INTESTINAL CALCIUM SECRETION. *(Ger.)* Schafer, H. J.; Otto, H. F. (Pathol. Inst., Univ. Hamburg, Germany). *Verh. Dtsch. Ges. Pathol.* 57:445, 1973.

1871 KINETICS OF CELL PROLIFERATION IN PARENCHYMAL ORGANS AND IN THE INTESTINAL EPITHELIUM OF JUVENILE RATS. *(Ger.)* Stocker, E. (Pathol. Inst., Univ. Wurzburg, Germany). *Verh. Dtsch. Ges. Pathol.* 57:388, 1973.

1872 COMPLETE TRANSPLANTATION OF THE SMALL INTESTINE IN THE DOG: II. TWO COMPARATIVE SERIES OF ORTHOTOPIC AUTOGRAFTS AND HOMOGRAFTS. *(Fr.)* Vignal, J.; Tissot, E.; Moulay, A.; Papathanassiou, Z.; Faure, J. L. (Edouard Herriot Hosp., Lyon, France). *Lyon Chir.* 70(5):310-311, 1974.

See also, 1599, 1715, 1749.

GENERAL

1873 STABILITY OF NORMAL HUMAN FECAL FLORA DURING A CHEMICALLY DEFINED, LOW RESIDUE LIQUID DIET. *(E.)* Bornside, G. H.; Cohn, Jr., I. (Dep. Surg., Lousiana State Univ., New Orleans). *Ann. Surg.* 181(1):58-60, 1975.

The effect of feeding of a chemically defined, low residue diet (1200-1800 cal/day for 7 days) on fecal flora was studied in 10 healthy male volunteers. All stools were collected and 3 were cultured for aerobic and anaerobic bacteria: 1) a pre-diet specimen; 2) 1 on the 7th day of the diet; 3) one 3 days after resumption of a regular diet. During the low residue diet, total daily fecal output was decreased 70% with each subject passing only 2 or 3 stools over the 7-day period. Mean total aerobe and anaerobe counts were 10^7/g and 10^{10}/g, resp., throughout study. There was no overgrowth by opportunistic bacteria or fungi. Fecal flora were not altered nor was there any quantitative change in any bacterial group during the diet. It is concluded that the large numbers of bacteria remaining in the feces after a low residue diet do not warrant the sole use of such a regimen for preoperative colon preparation.

1874 ROLE OF INTESTINAL MICROBES ON BODY NITROGEN ACCUMULATION IN GERMFREE, GNOTOBIOTIC AND CONVENTIONAL MICE. *(E.)* Yamanaka, M.; Nomura, T.; Kametaka, M. (Cent. Inst. Exp. Anim., Tokyo, Japan). *J. Nutr. Sci. Vitaminol. (Tokyo)* 20(5):389-400, 1974.

The effects of intestinal microbes on the digestion and absorption of nutrients and on the retention of nitrogen were studied using 80-day-old germfree, *Escherichia coli* or *Staphylococcus epidermidis* monocontaminated (at 56 days of age) gnotobiotic, and conventional male mice. The semi-micro Kjeldahl method was used to measure total N and protein N in the carcasses and gut contents of these animals. The total body weight and liver and kidney weights were greater in the conventional mice than in the germfree or gnotobiotic mice. The total N/100 g body weight of the carcass was also greater among the conventional mice than among the germfree or gnotobiotic mice; the carcasses of the *S. epidermidis*-infected mice contained more N than those of the *E. coli*-infected mice, which in turn contained more total N than those of the germfree mice. There were no major differences among these groups in the accumulation of ^{15}N by the carcass, liver, or leg muscles 2 days after dietary administration of 0.2% ^{15}N-labeled secondary ammonium phosphate; however, the conventional mice tended to accumulate more ^{15}N than the other groups. The total N/100 g body weight in the intestinal contents was highest in the germ-free mice, followed by the *E. coli*-infected, *S. epidermidis*-infected, and conventional animals. Nitrogen levels in the cecal contents of the germ-free and gnotobiotic mice were considerably higher than those in the cecal contents of the conventional mice. The ratio of protein N:total N in the cecum, colon, and rectum was significantly higher in the conventional animals than in the others, and the ratio was lower in both gnotobiotic groups than in the germfree animals. The ratio throughout the rest of the gut was basically the same in all 4 groups, and the groups did not differ in total Cr_2O_3/U body weight in the stomach, colon, and rectum. However, the cecal and small intestinal Cr_2O_3 contents of the conventional mice were lower than those of the gnotobiotic and germfree animals. Except in the colon and rectum, total N/100 mg Cr_2O_3 was higher in the gut contents of the conventional mice than in the other mice. The results indicate that intestinal microbes affect the nutrition of the host, *S. epidermidis* alone having a beneficial effect.

1875 CHARACTERIZATION OF HUMAN COLONIC MUCOPROTEIN ANTIGEN. *(E.)* Gold, D.; Miller, F. (Health Sci. Cent., State Univ. New York, Stony Brook). *Immunochemistry* 11(7):369-375, 1974.

Human colonic mucoprotein antigen was purified and its physical, chemical and immunological characteristics are described. The crude antigen preparation was extracted using a phenol-water solvent system. Concentrations of 0.1-10.0 mg/ml of the antigen were used. Descending paper chromatography was used for the qualitative determination of monosaccharides, and amino acid analysis and hexosamine ratios were determined by using a Beckman Amino Acid Analyzer Model 120C. A Hewlett-Packard Model 402 Gas Chromatograph was used for the determination of individual neuraminic acids. The purified antigen was found to be a sulfated mucoprotein with N-glycolylneuraminic acid, galactosamine, glucosamine, galactose and fucose being the only monosaccharides present (in the molar ratios of 19:23:23:26:10, resp.). The antigen was also found to be rich in threonine, serine, proline, glycine and glutamic acid. The molecular weight was estimated to be 1.5 x 10^7 daltons. Colonic mucoprotein antigen appears chemically similar to blood group substance A. However there was no immunological cross reactivity between the 2 molecules, nor was there an immunological similarity between colonic mucoprotein antigen and carcinoembryonic antigen as determined by double diffusion and immunoelectrophoresis. It is suggested that this colonic mucoprotein antigen may be endogenous in ulcerative colitis and may be a specific antigen for the detection of colonic carcinoma.

1876 COMPARISON OF METABOLIC ACTIVITY OF RUMEN MICROFLORA IN LAMBS AND ADULT SHEEP: IN VITRO UTILIZATION OF UREA NITROGEN AND SUGARS. *(Fr.)* Barry, J. L.; Durand, M. (Lab. Technol. Anim. Food, Jouy-en-Josas, France). *C. R. Acad. Sci.* [*D*] *(Paris)* 279:1373-1376, 1974.

1877 EXPERIMENTAL AND CLINICAL EXPERIENCE IN SUBCUTANEOUS SPLENIC TRANSPOSITION TO PREVENT BLEEDING FROM OESOPHAGEAL VARICES. *(E.)* Bengmark, S. (no affil.). *S. Afr. J. Surg.* 12(2): 64, 1974.

1878 IS THERE AN ANTRAL-BODY PORTAL SYSTEM IN THE STOMACH? *(E.)* Taylor, T. V.; Torrance, H. B. (R. Infirm., Manchester, England). *Gut* 15(10):836, 1974.

1879 THE TRANSILLUMINATION TECHNIQUE IN STUDYING INTRAMURAL BLOOD FLOW TO ASSESS THE VIABILITY OF THE GASTRIC WALL. *(Rus.)* Druzhkov, B. K. (V. I. Lenin Inst. Postgrad. Med., Kazan, USSR). *Eksp. Khir. Anestesiol.* (6):31-33, 1974.

1880 THE CIRCULATION OF THE SMALL BOWEL MUCOSA. *(E.)* Lundgren, O. (Dep. Physiol., Univ. Goteborg, Sweden). *Gut* 15(12):1005-1013, 1974.

1881 GEOPHAGIA AND MINERAL NUTRITION IN WILD PRIMATES. *(Fr.)* Hladik, C. M.; Gueguen, L. (Mus. Nat. Hist., Brunoy, France). *C. R. Acad. Sci.* [*D*] *(Paris)* 279:1393-1396, 1974.

1882 RENAL INACTIVATION OF SECRETIN AND CHOLECYSTOKININ. *(Ger.)* Lehnert, P.; Stahlheber, H.; Forell, M. M.; Fullner, R.; Fruhauf, S. (2nd Med. Clin., Univ. Munich, Germany). *Z. Gastroenterol.* 12(4):269-272, 1974.

1883 THE EXISTENCE OF A SPECIAL APPETITE-REGULATING HORMONE, ARENTERIN, IN THE INTESTINE. *(Rus.)* Skvortsova, N. N.; Volkonskaia, V. A.; Tuliaganova, E. Kh.; Zabolotnykh, V. A.; Ugolev, A. M.; Khokhlov, A. S. (I. P. Pavlov Inst. Physiol., Leningrad, USSR). *Dokl. Akad. Nauk SSSR* 220(2):493-495, 1975.

1884 SURFACE AREA AND EFFECT OF DRYING TEMPERATURE RELATED TO DRY WEIGHT OF JEJUNAL TISSUE IN RAT. *(E.)* Lucas, M. L.; Johnson, I. T. (Dep. Physiol., Ludwig-Maximillian Univ., Munich, Germany). *Experientia* 30(12):1487-1488, 1974.

See also, 1815.

DIAGNOSTIC PROCEDURES

1885 ANGIOGRAPHY IN ACUTE INTESTINAL ISCHEMIA. *(Fr.)* Poilleux, J.; Bigot, R.; Monnier, J. P.; Hivet, M. (St. Antoine Hosp., Paris, France). *Ann. Chir.* 27(6):623-625, 1973.

Intestinal ischemia can be caused by 3 conditions: (1) aortic dissection; (2) emboli, usually in the superior mesenteric artery; and (3) thrombosis resulting from acute arteritis. All of these lesions can be diagnosed by angiography. Surgical possibilities in (1) are limited to those rare patients who can undergo prosthetic replacement of the aorta and reimplantation of the splanchnic and renal blood vessels. In (2), if angiography shows the embolism is located in the proximal superior mesenteric artery, a limited intestinal resection may be performed. If the embolism is located in the distal superior mesenteric artery, medical therapy is indicated. If the patient fails to respond or if chronic ischemia of the small intestine develops 2-3 months later, a segmental resection of the small intestine should be performed. Thrombosis can be diagnosed only by lateral aortography. If the superior mesenteric artery is thrombosed, as is most often the case, treatment consists of reimplantation associated with more or less extensive intestinal resection. In some cases, thrombosis of the gastrointestinal arteries may necessitate double celiac and superior mesenteric revascularization. For the diagnosis of acute intestinal ischemia it is recommended that lateral and ventral aortography always be performed and, if necessary, selective arteriography.

1886 SELECTIVE PHLEBOGRAPHY OF THE PANCREAS. *(E.)* Gothlin, J.; Lunderquist, A.; Tylen, U. (Univ. Hosp., Lund, Sweden). *Acta Radiol.* 15(5): 474-480, 1975.

A new method is presented for selective catheterization of the pancreatic veins by a transhepatic approach. Of 40 patients, 7 were examined by this method, 4 with carcinoma of the bile ducts with no pancreatic involvement, 2 with pancreatic carcinoma, and 1 with portal hypertension. The catheter was inserted by the usual technique for transhepatic cholangiography, guided into the main stem of the portal vein, and then into the pancreatic veins as in the transumbilical technique. The remaining 33 patients were controls with a malignant tumor outside the pancreatico-duodenal area, on whom the transumbilical approach was used. The pancreatic veins had an abnormal appearance in the 2 patients with pancreatic carcinoma. In 1 several venous branches were obstructed and others were irregularly invaded. In the other the posterior superior pancreatico-duodenal vein was compressed, but catheterization was still possible. There were no major complications in the controls, but 2 of the patients given the transhepatic technique developed intraabdominal bleeding. These 2 patients had jaundice, however, giving them additional risk of bleeding. It is concluded that pancreatic phlebography may be a technique of some clinical importance in the diagnosis of pancreatic lesions.

1887 CHANGES IN THE SERUM LIPASE ACTIVITY AFTER ENDOSCOPIC RETROGRADE PANCREATOGRAPHY. *(Ger.)* Bornschein, W.; Weiss, H. D.; Kramann, B. (2nd Med. Clin., Munich Tech. Univ., Germany). *Dtsch. Med. Wochenschr.* 99(41):2028-2032, 1974.

Serum lipase activities were measured before and immediately after retrograde endoscopic pancreatography and 24 and 48 hr thereafter in 46 randomly selected patients. Before endoscopy, 13 patients had increased lipase activities: 11 of these 13 had radiological evidence of changes in the pancreatic ducts (chronic pancreatitis, pancreatic abscess associated with chronic pancreatitis, pancreatic neoplasms, and dysontogenetic cysts). The remaining 2 patients had acute and chronic hepatitis, resp., with normal pancreatic ducts. Although none of these patients developed clinical symptoms of pancreatitis, 36 of the 46 patients had serum lipase levels as high as 6380 U/liter/min immediately after endoscopy. In all cases, these lipase activities decreased significantly after 24 hr and were in the normal range in 20 of the 36 patients after 48 hr. The remaining 16 patients consisted of the 13 with initially elevated lipase activities and 3 patients who had unusually large increases after endoscopy. A correlation was found between the increase in serum lipase levels and the extent to which the pancreatic ducts were filled. Because of the small number of cases, this correlation was significant only for patients with filling of the main and accessory ducts and for those in whom the parenchyma was visualized. The average rate at which serum lipase levels decreased was independent of changes in the pancreatic duct, parenchymal visualization, and the initial level of lipase activity.

1888 PHOSPHATASES. VII. ALKALINE PHOSPHATASE IN BIOPSY SPECIMENS OF NORMAL AND DAMAGED HUMAN LIVER. *(E.)* Stepan, J.; Volek, V.; Balas, V.; Vecerek, B. (Fac. Med., Charles Univ., Prague, Czechoslovakia). *Acta Hepatogastroenterol. (Stuttg.)* 21 (6):425-429, 1974.

The isozymes of liver alkaline phosphatase were studied in liver biopsy specimens from patients with normal and non-cholestatically diseased livers, and compared with those in the serum. Controlled or blind needle biopsies were taken from the right and left hepatic lobes from 6 patients with fatty liver disease, eight with cirrhosis, 10 with chronic hepatitis, and nine with non-cholestatic gallbladder disease. Nine patients without liver disease served as controls. Total liver alkaline phosphatase activity was determined for 10 mM 4-nitrophenylphosphate and referred to g wet tissue weight and mg protein. The remainder of liver homogenate was subjected to electrophoresis for 60 min at 3 C, 30 V/cm and 5 mA/cm. In all patients, serum liver alkaline phosphatase isozymes were determined by inactivation-inhibition and agar gel electrophoresis. In the liver tissue, only the chronic hepatitis patients showed a significant increase in liver alkaline phosphatase activity. In the serum, the total activity and liver isozyme of serum liver alkaline phosphatase were significantly increased in all patients with diseased livers. Gel electrophoresis showed 3 bands of enzyme activity in liver tissue. Slow anodic was found in normal and gallbladder disease patients. Fast anodic was found in most of the fatty liver cases and 70% of the chronic hepatitis cases. A cathodic band was found in 1/3 of the cirrhotic patients. Electrophoretically identical bands were found in the serum. It is concluded that there is no direct diagnostic effect of liver alkaline phosphatase patterns in liver tissue, but that they do correlate with serum phosphatase patterns.

1889 SINGLE-VISIT ORAL CHOLECYSTOGRAPHY. *(E.)* Burhenne, H. J.; Obata, W. G. (Child. Hosp., Adult Med. Cent., San Francisco, Calif.). *N. Engl. J. Med.* 292(12):627-628, 1975.

Fractionated 2 day administration of 6 g iopanoic acid followed by a single radiography session on a 3rd day was studied on 611 ambulatory patients undergoing cholecystography. Each patient was put on a low fat diet for 2 days during which 12 tablets were taken; 4 on day 1 and 8 on day 2. A single X-ray examination was made and classified as adequate visualization, poor visualization, or non-visualization. Fifty patients had adequate visualization of a normal gallbladder; 31, adequate visualization of cholelithiasis; and 1 of cholesterol polyps. Twenty had non-visualization, 7 due to extrinsic causes, 11 had operative confirmation of cholelithiasis; and 2 were not followed up. Six patients had poor visualization due to diarrhea but had adequate visualization with the calcium salts of sodium ipodate. The findings correlate statistically with those patients given 1 day administration of iopanoic acid. This fractionation technique eliminates the need for repeat oral cholecystography, often found with iopanoic acid administration.

1890 ENDOSCOPIC RETROGRADE CHOLANGIOGRAPHY (ERC) IN PATIENTS WITH JAUNDICE. *(E.)* Classen, M.; Koch, H.; Schwamberger, K.; Demling, L. (Med. Clin., Univ. Erlangen, Germany). *Rend. Gastroenterol.* 6(2):116-120, 1974.

The value of endoscopic retrograde cholangiography in the differential diagnosis of jaundice was investigated, and the results compared with those obtained by puncture techniques. Of 114 patients (all with serum bilirubin values over 4.0 mg%), positive findings were obtained by endoscopic retrograde cholangiography in 85 cases (74.5%). These included: choledocholithiasis (40); exclusion of extrahepatic jaundice (15); carcinoma of the head of the pancreas (seven); tubular stenosis of the common bile duct (five); common bile duct stenosis and papillary stenosis without demonstrated stones (four each); contracted choledochoduodenostomy with food in the bile duct system (three); papillary injury and tumor of the efferent bile ducts (two each); and intrahepatic concrements, cholelithiasis and choledocholithiasis with perforation of stone into the colon, and primary sclerosing cholangitis (one each). The cause of jaundice was also determined by duodenoscopy and endoscopic retrograde cholangiography in an additional seven patients, bringing the total of positively-diagnosed cases to 80.7%. The use of endoscopic retrograde cholangiography did not succeed in visualization of the efferent bile ducts in the remaining 22 cases. Because puncture techniques such as percutaneous transhepatic cholangiography and laparoscopic cholecystocholangiography are contraindicated in the presence of hemorrhage; are reported to be successful in only about 50% of cases; and have complication rates of up to 5% (the transhepatic technique), it is concluded that endoscopic retrograde cholangiography should be first considered for diagnosis in cases of jaundice.

1891 ESOPHAGUS, STOMACH, AND DUODENUM: RADIOLOGICAL DIAGNOSIS. *(Ger.)* Fernholz, H. J. (Med. Fac., Rhenish-Westphal. Tech. Coll., Aachen, Germany). *Therapiewoche* 24(17):1865-1871, 1974.

1892 ESOPHAGUS, STOMACH, AND DUODENUM: FUNCTIONAL DIAGNOSIS. *(Ger.)* Hausamen, T. U.; Fritsch, W. P. (1st Med. Clin. A., Univ. Dusseldorf, Germany). *Therapiewoche* 24(17):1848-1860, 1974.

1893 CLINICAL APPLICATION OF MANOMETRIC STUDIES OF THE ESOPHAGUS. *(Sp.)* Nogueira, J. R. (Spanish Hosp., Mexico City). *Galicia Clin.* 45(9): 831-839, 1973.

1894 ESOPHAGUS AND STOMACH: ENDOSCOPIC DIAGNOSIS. *(Ger.)* Frotz, H. (Med. Clin., Univ. Cologne, Germany). *Therapiewoche* 24(17): 1872-1879, 1974.

1895 GASTRIC SCINTIGRAPHY IN THE DIAGNOSIS OF CANCER. *(Ger.)* Judin, L. A.; Kusnezov, N. A.; Selichova, V. V. (I. M. Sechenov 1st Moscow Med. Inst., USSR). *Radiol. Diagn. (Berl.)* 14(6): 758-759, 1973.

1896 THE DIAGNOSTIC VALUE OF CONTROLLED BIOPSIES OF GASTRIC TUMORS. *(Ger.)* Hampel, K. E.; Stopik, D.; Niedobitel, F. (Westend Clin., Free Univ. Berlin, Germany). *Z. Gastroenterol.* 12(5):315-320, 1974.

1897 CONTRIBUTION OF GASTROSCOPY TO THE STUDY OF GASTRIC CANCER: OUR EXPERIENCE. *(Sp.)* Herrerias, J. M.; Navarro, F.; Osorio, M.; Jurado, M.; Jimenez, J.; Aljama, P.; Damiano, A.; Chamorro, J. (Fac. Med., Cadiz, Spain). *Rev. Esp. Enferm. Apar. Dig.* 44(7):697-706, 1974.

1898 METOCLOPRAMIDE IN RADIOLOGICAL FUNCTIONAL DIAGNOSIS OF THE STOMACH AND INTESTINE. *(Ger.)* Schulz, H. G.; Gottschild, D. (Radiol. Clin., Karl Marx Univ., Leipzig, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 33(6):299-307, 1973.

1899 INTESTINAL ENDOSCOPY: LITERATURE REVIEW. *(Rus.)* Malinovskii, N. N.; Starikova, V. B.; Fenomenov, A. M. (All-Union Res. Inst. Clin. Exp. Surg., Moscow, USSR). *Khirurgiia (Mosk.)* (11): 120-127, 1974.

1900 DUODENAL ENDOSCOPY WITH CATHETERIZATION OF THE PAPILLA. *(Ger.)* Franken, F. H.; Janssen, M.; Falck, J.; Voigt, K. (St. Josef Hosp., Wuppertal-Elberfeld, Germany). *Therapiewoche* 24(17): 1880-1886, 1974.

1901 THE VALUE OF OUTPATIENT FIBERSIGMOIDOSCOPY. *(Ger.)* Jenny, S.; Fumagalli, I.; Hugel, H.; Nuesch, H. J.; Deyhle, P. (Dep. Intern. Med., Univ. Zurich, Switzerland). *Z. Gastroenterol.* 12(1):46, 1974.

1902 OCCULT BLOOD IN THE STOOLS AS A SCREENING TEST FOR COLORECTAL CANCER AND PRECANCEROUS POLYPS: A FIELD STUDY OF 815 ADULTS. *(Ger.)* Gnauck, R. (German Diagn. Clin., Wiesbaden). *Z. Gastroenterol.* 12(4):239-250, 1974.

1903 THERMOGRAPHY IN ACUTE APPENDICITIS. *(Rus.)* Orlov, N. S.; Cherniaev, Iu. S. (Arkhangelsk Med. Inst., USSR). *Klin. Khir.* (8):5-11, 1974.

1904 NEW MATHEMATICAL TECHNIQUE FOR ELIMINATING THE LIVER FROM THE PANCREATIC SCINTIGRAM. *(Ger.)* Markwardt, J.; Nauber, G.; Rosche, G.; Oczko, B. (Cent. Inst. Cancer Res., Berlin-Buch, Germany). *Radiol. Diagn. (Berl.)* 14(6):757-758, 1973.

1905 A PANCREATIC FUNCTION TEST USING COMBINED, CONTINUOUS SECRETIN AND PANCREOZYMIN STIMULATION. *(Ger.)* Seiffert, U. B.; Roth, W. D. (Cent. Intern. Med., Johann Wolfgang Goethe Univ., Frankfurt/Main, Germany). *Z. Gastroenterol.* 12(2):87-94, 1974.

1906 SIGNIFICANCE OF A NEW METHOD FOR THE DIAGNOSIS OF PANCREATIC DISEASE. *(It.)* Scarabelli, L.; Bonandrini, L. (Inst. Clin. Gen. Surg. Surg. Ther., Univ. Pavia, Italy). *Arch. Ital. Chir.* 97(1):101-107, 1973.

1907 CLINICAL AND EXPERIMENTAL PRINCIPLES FOR THE ENZYME DIAGNOSIS OF ACUTE PANCREATITIS. *(Rus.)* Starodubtseva, L. N.; Bolgova, G. D. (Rostov Med. Inst., USSR). *Klin. Khir.* (9):30-35, 1974.

1908 THE DIAGNOSTIC VALUE OF ENDOSCOPIC PANCREATOGRAPHY (ERP) IN PANCREATITIS: CORRELATION WITH EXOCRINE FUNCTION. *(Ger.)* Ammann, R.; Deyhle, P.; Fumagalli, I.; Hofmann, K. (Dep. Intern. Med., Univ. Zurich, Switzerland). *Z. Gastroenterol.* 12(1):20-21, 1974.

1909 RETROGRADE CHOLANGIOPANCREATOGRAPHY: TECHNICAL PROBLEMS, COMPLICATIONS, AND VALUE OF THE TECHNIQUE. *(Ger.)* Witzel, L.; Halter, F.; Fluckiger, J.; Ludin, J.; Vogeli, E. (Inselspital, Bern, Switzerland). *Z. Gastroenterol.* 12(1):22-23, 1974.

1910 DIAGNOSIS OF HEPATOLENTICULAR DEGENERATION WITH A RADIOACTIVE COPPER TEST. *(Ger.)* Biesold, D.; Bunther, K.; Lobe, J.; Lossner, J. (Neurol. Clin., Karl Marx Univ., Leipzig, Germany). *Radiol. Diagn. (Berl.)* 14(6):760, 1973.

1911 ADVERSE REACTIONS TO BROMOPHTHALEIN WHEN USED TO TEST FOR LIVER FUNCTION: REVIEW OF THREE PATIENTS. *(Ser.)* Tomasevic, M.; Tadic-Tigerman, V.; Jankovic, J.; Aganovic, V. (Mil. Hosp., Sarajevo, Yugoslavia). *Vojnosanit. Pregl.* 31(5):336-338, 1974.

1912 AN APPROACH TO THE DIAGNOSIS OF LIVER DISORDERS USING ^{123}I-BSP. *(E.)* Reuben, A.; Narasimah, K.; Myers, M.; Wood, T.; Britton, K. (Middlesex Hosp., London, England). *Gut* 15(10):837, 1974.

1913 EXPERIMENTAL STUDY OF THE DETECTION OF DEFECTS IN HEPATIC SCINTIGRAMS BY USING A COLLIMATOR WITH HIGH RESOLUTION. *(Ger.)* Brase, A.; Jahns, E.; Ohlendorf, M. (Med. Coll., Hanover, Germany). *Strahlentherapie* 48(4):359-365, 1974.

1914 HEPATIC SCANNING IN THE DIAGNOSIS OF LIVER ABSCESS. *(E.)* Rizk, G. K.; Massabni, S. R.; Mudarris, F. (Amer. Univ. Med. Cent., Beirut, Lebanon). *Leban. Med. J.* 27(5):543-550, 1974.

1915 LIVER ASPIRATION CYTOLOGY. *(E.)* Brits, C. J. (no affil.). *S. Afr. Med. J.* 48(53):2207-2214, 1974.

1916 PERCUTANEOUS NEEDLE BIOPSY OF THE LIVER AND LARGE BILE DUCT OBSTRUCTION. *(E.)* Morris, J. S.; Gallo, G. A.; Scheuer, P. J.; Sherlock, S. (R. Free Hosp., London, England). *Gut* 15(10):824, 1974.

1917 THE SITE OF INTERCOSTAL LIVER BIOPSY. *(E.)* Mikulecky, M.; Hantak, I. (1st Med. Clin., Comenius Univ., Bratislava, Czechoslovakia). *Acta Hepatogastroenterol. (Stuttg.)* 21(6):419-421, 1974.

1918 DIFFERENTIAL DIAGNOSIS OF CHRONIC LIVER DISEASE WITH SEROCHEMISTRY BY USING DISCRIMINANT ANALYSIS WITH SPECIAL CONSIDERATION OF THE MESENCHYMA. *(Ger.)* van Husen, N.; Eberhardt, G.; Gerlach, U.; Intorp, H. W.; Oberwittler, W. (Med. Clin., Univ. Munster, Germany). *Z. Gastroenterol.* 12(5):327-334, 1974.

1919 CAN HB Ag BE DETECTED IN LIVER BIOPSIES WITH THE LIGHT MICROSCOPE? COMPARISON OF HB Ag IN SERUM WITH RESULTS FROM ALDEHYDE-THIONINE STAINING. *(Ger.)* Vogel, H. M.; Henning, H.; Luders, C. J.; von Braun, H. H.; Tripatzis, I. (Fohrenkamp Clin., Molln/Lauenburg, Germany). *Z. Gastroenterol.* 12(4):257-264, 1974.

1920 THE CLINICAL IMPORTANCE OF DETERMINING VARIOUS IMMUNOGLOBULINS IN VIRAL HEPATITIS IN CHILDREN. *(Ukr.)* Trishkova, L. O. (Kiev Med. Inst., USSR). *Pediatr. Akush. Ginekol.* (5):7-8, 1974.

1921 DUODENOGRAPHIC RADIOLOGICAL DIAGNOSIS OF THE PAPILLA OF VATER. IV. THE DIFFERENTIAL DIAGNOSIS OF DISEASES OF THE PAPILLA. *(Ger.)* Kamieth, H. (no affil.). *Radiologe* 14(3):149-153, 1974.

1922 CYTOLOGICAL STUDIES OF THE DUODENAL CONTENTS IN THE DIAGNOSIS OF BILIARY DISEASES. *(Rus.)* Orlova, V. P.; Kapral, Kh. A. (Tallin Br. Hosp., Baltic Railroad, USSR). *Klin. Med.* 51(11): 84-88, 1973.

1923 SIGNIFICANCE OF LIVER FUNCTION STUDIES IN AMOEBIASIS. *(E.)* Menkurkar, P. R.; Merchant, H. C.; Rao, P. R.; Satoskar, R. S. (L. T. M. Med. Coll., Bombay, India). *J. Postgrad. Med.* 20(4):166-175, 1974.

See also, 1952, 2222, 2247, 2332, 2390.

GASTROINTESTINAL DISEASES

ESOPHAGUS

1924 BIOFEEDBACK CONTROL OF LOWER ESOPHAGEAL SPHINCTER CONTRACTION IN MAN. *(E.)* Schuster, M. M.; Nikoomanesh, P.; Wells, D. (Baltimore City Hosp., Md.). *Proc. Int. Symp. Gastrointest. Motility, 4th, 1973* pp. 139-144.

Studies were conducted on 3 normal subjects and 6 patients with gastroesophageal reflux symptoms to determine whether lower esophageal sphincter pressures could be controlled following operant conditioning. Sphincter pressure was monitored by manometer in the supine resting subject. All subjects, while observing the meter, were instructed to cause the meter reading to increase without changing respiration or using voluntary muscles. On the average, normal subjects increased lower esophageal sphincter pressure by 75% during training (maximum increase = 14 mm Hg) whereas no changes occurred in intraesophageal or gastric pressures. Patients with reflux increased sphincter pressure during conditioning by as much as 5-6 mm Hg. One reflux patient, however, showed a sharp drop in sphincter pressure (-6 mm Hg). These studies suggest that control of lower esophageal sphincter pressure is possible by operant techniques and further suggest that mediation by voluntary muscle is not necessary to accomplish this.

1925 RELATIONSHIP BETWEEN CHANGES IN PLASMA GASTRIN AND LOWER OESOPHAGEAL SPHINCTER PRESSURE AFTER MEALS. *(E.)* McCall, I. W.; Harvey, R. F.; Owenc, C. J.; Clendinnen, B. G. (R. Infirm., Bristol, England). *Br. J. Surg.* 62(1):15-18, 1975.

Lower esophageal sphincter pressures and plasma gastrin levels were measured and compared in 20 volunteers after a standard protein meal. Symptomatic esophageal reflux was observed in 3 and the remaining 17 had normal gastrointestinal tracts. After a 6 hr fast, all had basal esophageal sphincter pressures measured, and venous blood samples were radioimmunoassayed for gastrin content. Subjects were given a standard meal of 8.0 g meat extract in 300 ml water at pH 7.0. Sphincter pressures and blood samples were taken at 5, 10, 15, 20, 30, 45, 60, and 75 min after the meal. There was a significant rise in gastrin levels from 27.3-74.4 pg/ml within 20 min in all but 3 subjects. There was also a significant rise in sphincter pressure of 53.4% after 43.0 min. In 5 subjects, gastrin levels did not change appreciably, and pressures rose slightly but not significantly (18.0%). These 5 included the 3 with gastroesophageal reflux. Correlation between the peak rises of gastrin level and sphincter pressure was not significant until the 2 subjects with the highest gastrin level rises were removed. It is suggested that low sphincter pressure and associated reflux may be due to a defect in gastrin release from the stomach.

1926 THE RESPONSE OF THE LOWER OESOPHAGEAL SPHINCTER TO MAXIMAL DOSES OF PENTAGASTRIN. *(E.)* Trindade, L. M.; Rosenberg, I. L.; Rozycki, Z. J.; Giles, G. R. (St. James's Hosp., Leeds, England). *Br. J. Surg.* 62(1):11-14, 1975.

Responses of the lower esophageal sphincter and of gastric secretion to pentagastrin were investigated in patients with dyspepsia but no gastroesophageal reflux and in patients with hiatus hernia and reflux. After a 12 hr fast, subjects swallowed a multiple tube system for pressure measurements and gastric aspiration. Gastric secretion was collected for 1 hr, after which sphincteric pressure was measured for a 5 min period. A 6 g/kg dose of pentagastrin was given i.m. and the lower esophageal sphincter pressure was measured at 0, 4, 8, 10, 15, 20, 30, 40, 50 and 60 min after injection. Gastric secretion was collected in 10 min aliquots between pressure measurements. All subjects showed an increase in sphincteric pressure and gastric acid output following injection. The 16 subjects with dyspepsia showed an increase in sphincteric pressure of 87.43%, and acid ouput rose from 4.64 mEq/hr to 39.3 mEq/hr. The 9 subjects with hiatus hernia and reflux showed a pressure increase of 110.2% and acid output rose from 5.4 to 36.0 mEq/hr. These values were not significantly different from the 1st group. Four subjects with hiatus hernia but no reflux showed a pressure increase of 85.8%. Acid output rose from 4.9 to 32.9 mEq/hr. No statistical comparison was possible with the other 2 sets. It is concluded that there is no statistically significant correlation between sphincter response to pentagastrin in dyspeptic and hiatus hernia patients, nor between sphincter pressure and acid output.

1927 OESOPHAGEAL MOTOR DYSFUNCTION IN PATIENTS WITH DIVERTICULA OF THE MID-THORACIC OESOPHAGUS. *(E.)* Kaye, M. D. (Univ. Colo. Med. Cent., Denver). *Thorax* 29(6):666-672, 1974.

Manometric studies were performed on 12 patients with diverticula of the mid-thoracic esophagus. In 8 patients the diverticulum was near the interbranchial level, in 2 between the middle and distal thirds, and in 2 others within the distal third. Patients were studied in a supine position after an overnight fast, by means of 3 polyvinyl catheters. Lower esophageal sphincter contractions were classified as abnormal if they occurred spontaneously, lasted longer than 30 sec, or were repetitive. In 7 of the patients abnormal sphincteric contraction was found; in 2, sphincteric contraction was disturbed by spontaneous contractions, and in 3 by repetitive and/or prolonged post-deglutitive contractions. The frequency of prolonged contractions increased progressively from proximal to distal esophagus, while repetitive contractions were not correlated with site. Nine patients showed abnormal spontaneous motor activity. One had vigorous achalasia, 5 had diffuse esophageal spasm, and 6 did not adhere to any previously defined pattern. It is concluded that an underlying esophageal motor dysfunction be suspected in patients with mid-thoracic esophageal diverticula.

1928 OESOPHAGEAL ACID CLEARING: ONE FACTOR IN THE PRODUCTION OF REFLUX OESOPHAGITIS. *(E.)* Stanciu, C.; Bennett, J. R. (Hull R. Infirm., Kingston upon Hull, England). *Gut* 15(11):852-857, 1974.

Esophageal acid clearing, 1 factor in the production of reflux esophagitis, was studied in 89 subjects, who fell into 5 groups diagnostically. There were: 14 subjects without reflux symptoms; 4 patients with hiatal hernias but no reflux symptoms; 11 patients with duodenal ulceration and reflux symptoms; 55 patients with reflux symptoms (12 had hiatal hernia and 18 had gastroesophageal reflux shown radiologically); and 5 patients with esophageal motor abnormalities (2 achalasia and 3 diffuse esophageal spasm). Esophageal acid clearing was measured by counting the number of swallows needed to raise the pH of the lower esophagus from 1.5-5.0 after instillation of 15 ml 0.1 N hydrochloric acid. Normal subjects and those asymptomatic patients with hiatal hernias had a result less than 12. Patients with reflux symptoms and those with esophageal motility disorders had abnormal acid clearance (mean number of swallows greater than 12). Of the 20 patients with abnormal esophageal motility, 18 had prolonged acid clearing, however many patients with delayed clearing had no abnormal motility. As the degree of esophagitis increased, acid clearing deteriorated. Acid clearance correlated well with the mean duration of spontaneous episodes of acid reflux during 15-hr continuous recordings of lower esophageal pH. Abnormal acid clearance was improved by raising the bedhead, by medical treatment for esophagitis, and by i.v. metoclopramide. Abnormal acid clearing may result from disturbed esophageal motility and render these patients susceptible to reflux esophagitis. However, gastroesophageal reflux may lead to impaired acid clearance, by creating abnormal motility and by effects on the esophageal wall, and thus lead to a 'vicious-spiral' esophagitis. Acid clearance must be improved when treating gastroesophageal reflux.

1929 MOTILITY STUDIES IN FIFTY PATIENTS WITH ACHALASIA OF THE ESOPHAGUS. *(E.)* Uribe, Jr., P.; Csendes, A.; Larrain, A.; Ayala, M. (Jose Joaquin Aquirre Hosp.), Univ. Chile, Santiago). *Am. J. Gastroenterol.* 62(4):333-336, 1974.

Esophageal motility studies were performed on 50 patients with achalasia and 30 normal controls. Patients were intubated through the mouth while in a supine position, with continuously perfused polyethylene catheters. The catheters were withdrawn from fundus to thorax, taking periodic 10 sec pressure readings. The achalasia patients had a resting gastroesophageal pressure of 19.0 mm Hg, significantly higher than control values (11.0). On swallowing, the percentage of sphincter relaxation was 52.6% as compared to 100% for the controls. The intraesophageal resting pressure was 6.1 in the achalasia patients and -3.5 in the controls. This confirms previous findings that relaxation of the gastroesophageal sphincter does occur during swallowing in achalasia, and that hypertensive gastroesophageal sphincter also occurs in this condition.

1930 IMPROVEMENT IN LOWER ESOPHAGEAL SPHINCTER PRESSURE FOLLOWING SURGERY FOR COMPLICATED GASTROESOPHAGEAL REFLUX. *(E.)* Dimarino, A. J.; Rosato, E.; Rosato, F.; Cohen, S. (Hosp. Univ. Pennsylvania, Philadelphia). *Ann. Surg.* 181(2):239-242, 1975.

A comparison was made of the pre- and postoperative lower esophageal sphincter (LES) pressures in nine patients undergoing a posterior gastropexy for complicated gastroesophageal reflux. Ten age-matched controls were also evaluated. Water-filled polyvinyl catheters (1.4 mm internal diameter) were used to transmit intra-luminal pressures to external transducers. Pressures from esophagus, LES, and stomach were simultaneously recorded. LES pressure was increased from 4.4 to 13.9 mm Hg following surgery. The ratio of the change in LES pressure compared to the change in gastric pressure during increases in intra-abdominal pressure ($\Delta S:\Delta G$) was 0.59 preoperatively and 0.94 postoperatively. All patients were asymptomatic after surgery. Although the resting LES pressure and the $\Delta S:\Delta G$ ratio following surgery were increased, they remained significantly less than comparable values in the controls. The results suggest that the clinical improvement following surgery for gastroesophageal reflux may be due to the increase in resting LES pressure and the improved response of the lower esophageal sphincter to increased intra-abdominal pressure.

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ESOPHAGUS

1954 MANOMETRIC ASSESSMENT OF OESOPHAGEAL FUNCTION AFTER THE NISSEN FUNDOPLICATION. *(E.)* Bremner, C. G. (Dep. Surg., Univ. Witwatersrand, Johannesburg, South Africa). *S. Afr. J. Surg.* 12(2): 73, 1974.

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1957 ESOPHAGUS, STOMACH, AND DUODENUM: MEDICAL THERAPY. *(Ger.)* Gerlach, U.; van Husen, N. (Med. Clin., Univ. Munster, Germany). *Therapiewoche* 24(17):1889-1895, 1974.

See also, 1655, 1663, 1666, 1891, 1892, 1893, 1894, 2270, 2315, 2331.

STOMACH

1958 MULTIPLE GASTROINTESTINAL SCHWANNOMAS (VON RECKLINGHAUSEN'S DISEASE). A FAMILIAL CASE. *(Fr.)* Rosner, D.; Hivet, M.; Lagadec, B.; Conte, J. (St. Antoine Hosp., Paris, France). *Med. Chir. Dig.* 2(1):39-44, 1973.

A 37-yr-old man had been hospitalized earlier for melena, had undergone gastro-duodenal transit, had been put on anti-ulcer treatment for a mid-duodenal ulcer, and had undergone 3 more episodes of melena and a normal i.v. cholangiograph had been taken. An 80 cm length of small intestine afflicted with schwannomas was resected, leaving some small tumors up to the terminal ileum. Multiple endo- and exointestinal nodular tumors were attached to the resected intestines. The prognosis was somewhat uncertain because of the multiplicity of the neurinomatous foci and because the largest, ulcerated tumor possibly represented the homolog of the "royal tumors" of von Recklinghausen's disease with subcutaneous symptoms, but 1 yr later the patient was still well. The pre-operative symptoms showed few signs of von Recklinghausen's disease: groups of spots resembling cafe au lait on the palms of the hands, the soles of the feet, and in the perianal region; lacunary images on x-rays of the mid-duodenal ulcer and the large ulcerated tumor. The patient's mother had died 10 yr earlier following surgery for hematemesis related to a degenerated gastric schwannoma. She also showed cutaneous signs of von Recklinghausen's disease. One of the patient's 2 sisters had been operated on twice for hematemesis, and the second time revealed an ulcerated tumor and numerous schwannomas along the small intestine. She also had the skin spots. The patient's 12-yr-old daughter showed cutaneous symptoms and digestive problems, but his 11-yr-old son had no symptoms. His first sister's 17-yr-old son had cutaneous signs and digestive problems, but her 2 younger children showed no symptoms. The patient's second sister's 11-yr-old daughter showed cutaneous signs and the intestines were suspect. Her 2 brothers showed no symptoms. This family study further adds to the literature on von Recklinghausen's disease.

1959 PATHOPHYSIOLOGY OF STRESS ULCER AND ITS PREVENTION. II. PROSTAGLANDIN E_1 AND MICROCIRCULATORY RESPONSES IN STRESS ULCER. *(E.)* Kawarada Y.; Lambek, J.; Matsumoto, T. (Hahnemann Med. Coll. Hosp., Philadelphia, Pa.). *Am. J. Surg.* 129(2):217-222, 1975.

The effects of prostaglandin E_1 in prevention of stress ulcers were investigated in the rat. Male Wistar rats (330) were fasted for 24 hr and most were subjected to stress by restraint for 2 hr in a conduit in a room at 4 C. Rats were divided into 10 groups: 5 groups had no prostaglandin or restraint; 5 had their stomachs inflated with air, but no prostaglandin or restraint; 5 were given 5 mg/kg prostaglandin s.c. but no restraint; 1 was restrained but given no prostaglandin; and the remaining 6 groups were restrained and given dosages of 0.5 mg/kg, 1.0 mg/kg, 2 mg/kg, 3 mg/kg, 4 mg/kg and 5 mg/kg prostaglandin s.c., resp. In 5 rats of each group, a silicone rubber compound was perfused through the gastric and duodenal arteries, capillaries, and veins. Acute gastric ulcers developed in 90% of restrained animals given no prostaglandin; 87% of those given 0.5 mg/kg; 65% given 1.0; 43% given 2.0; 17% given 3.0; and 0% given 4.0 and 5.0. The severity of the ulcers decreased along with the incidence. With increasing dosages, however, there were increasing symptoms of diarrhea, loss of activity, labored breathing, and increased nasal secretion. The mortality rates among the preceding 7 groups were 0%, 3%, 5%, 7.5%, 15%, 30%, 43%, and 56% resp. Comparison of the control group with the group with stomach distention showed the latter had thinner mucosa, muscle layers, and serosa, and narrowing of blood vessels. In the group given 5 mg/kg prostaglandin and no restraint, the mucosa, muscle layers, and serosa were stretched, but vasodilation could not be evaluated. In the group given restraint and no prostaglandin, the silicone rubber did not fill the capillaries well; avascular areas, necrosis, and blood clots were found. In the groups given 0.5 and 1.0 mg/kg, findings were similar to the previous group. In those given 2-3 mg/kg, the stomach wall layers were moderately stretched, and arterioles and collecting veins were narrow. In those given 4-5 mg/kg, the walls were extremely distended, and the vessels were moderately narrowed. It is concluded that prostaglandin at the 4-5 mg/kg dose prevents stress ulceration, but complications and mortality rates were higher than 40% at these doses.

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See also, 1727, 1891, 1892, 1894, 1895, 1896, 1897, 1898, 1936, 1957, 2010, 2016, 2023, 2028, 2029, 2058, 2298, 2331, 2334.

STOMACH

Peptic Ulcers

2000 SOME EARLY CHARACTERISTICS OF PEPTIC ULCER DECEDENTS.

(E.) Polednak, A. P. (State Dep. Health, Albany, N.Y.). *Gastroenterology* 67(6): 1094-1100, 1974.

A number of early characteristics were analyzed among 163 peptic ulcer decedents (79 gastric and 84 duodenal ulcer) and 163 age-matched control subjects. Data were obtained while the men were at Harvard University, at a mean age of 20 yr. Data were analyzed by matched pairs, the degree of association between the antecedent factor and the disease being evaluated by an odds ratio. There was no higher frequency of pulmonary disease (pneumonia, bronchitis, pleurisy, or asthma) in ulcer decedents as compared to controls. Both gastric and duodenal ulcer patients had lost more fathers than did controls, however duodenal ulcer cases had lost fewer mothers than controls. Palpitations, insomnia, and skin eruptions were reported more frequently by ulcer patients, while dyspepsia was not reported more frequently. These differences could reflect early life experiences or basic personality of ulcer-prone individuals, but additional studies must be done to clarify the role of such experiences or personality characteristics in ulcer pathogenesis.

2001 HYPOVITAMINOSIS B_{12} FOLLOWING PARTIAL GASTRECTOMY BY THE BILLROTH II METHOD.

(E.) Rygvold, O. (Ostfold Cent. Hosp., Fredrikstad, Norway). *Scand. J. Gastroenterol.* [*Suppl.*] 9(29):57-64, 1974.

Hypovitaminosis B_{12} following 2/3 partial gastrectomy by the Billroth II method was studied in 351 patients who were followed for 1-23 yr post-operatively. In 143 the surgery had been done for gastric ulcer, and in 208 for duodenal ulcer. Post-operative antianemic therapy had not been given. Vitamin B_{12} deficiency was found in 20%, with the incidence in the gastric ulcer group being twice as high as in the duodenal ulcer group. In 16% the serum B_{12} level was less than 150 pg/ml, and 16% had levels between 150 and 200 pg/ml. The regression of serum B_{12} was most marked during the first 8-10 years after surgery, then it leveled off. About 1/2 the patients with B_{12} deficiency had normal hemoglobin levels, and 1/3 of the deficient cases had iron deficiency also. Hypovitaminosis B_{12} combined with anemia was most often found in gastric ulcer patients and females. Patients with gastritic changes at the time of surgery and those with the smallest gastric stumps (according to radiographic assessment) had a greater preponderance of B_{12} deficiency. According to the Schilling tests, the hypovitaminosis B_{12} was due to intestinal malabsorption syndromes in 67% of those with serum B_{12} levels below 150 pg/ml, and in 69% of those in the 150-200 pg/ml range. In 32% the hypovitaminosis was due to deficiency of the intrinsic factor. The dumping syndrome and milk dyspepsia were the only types of post-operative dyspepsia correlated to some extent to the vitamin deficiency. Because of the high incidence of hypovitaminosis B_{12} patients with this type of operation, the author recommended prophylactic B_{12} and iron supplements.

2002 THE EFFECT OF POSTURE ON THE GASTRIC EMPTYING OF SOLID MEALS IN NORMAL SUBJECTS AND PATIENTS AFTER VAGOTOMY.

(E.) Hancock, B. D.; Bowen-Jones, E.; Dixon, R.; Testa, T.; Dymock, W.; Cowley, D. J. (Univ. Hosp. South Manchester, England). *Br. J. Surg.* 61(12):945-949, 1974.

The effect of posture on the gastric emptying rate of solid meals was studied in normal subjects and in patients after a truncal vagotomy and pyloroplasty or after a highly selective vagotomy. Ten healthy subjects and 10 vagotomy patients (within 3 months of surgery) were studied. A solid meal was labeled with ^{51}Cr and the rate of emptying measured with a gamma camera. In normal subjects, posture did not affect the rate of emptying, but in patients who had had a truncal vagotomy and pyloroplasty (total of 5 patients), the stomach emptied more rapidly when standing than when lying down. When lying down the rate of emptying was significantly less than in normal subjects, but normal when standing. In the 5 patients who had had a highly selective vagotomy the stomach emptied more rapidly when standing than when lying down, but when lying down the rate was normal. When standing the rate was significantly faster than that in normal subjects. Thus posture had a very striking effect on the rate of gastric emptying of solids after both types of vagotomy, but had no effect on emptying in normal subjects. There was no difference in the initial emptying rate between the 2 groups studied, which is in contrast to some previous studies.

2003 EFFECT OF RISING INTRAGASTRIC pH INDUCED BY SEVERAL ANTACIDS ON SERUM GASTRIN CONCENTRATIONS IN DUODENAL ULCER PATIENTS AND IN A CONTROL GROUP.

(E.) Feurle, G.E. (Med. Polyclin., Univ. Heidelberg, Germany). *Gastroenterology* 68(1):1-7, 1975.

The effects of 3 antacids (magnesium hydroxide, aluminium hydroxide, and calcium carbonate) on serum gastrin levels and intragastric pH were compared with the effects of the corresponding nonbuffering chloride compounds (magnesium chloride, aluminium chloride, and calcium chloride) in duodenal ulcer patients and in a control group. Patients with clinical and radiological evidence of duodenal ulcer (52) and 9 controls without gastrointestinal disease were used. No significant rise of serum gastrin levels occurred after $BaSO_4$ was given to assess the contribution of intragastric volume. Intragastric pH and serum gastrin, determined radioimmunologically, increased in patients after $Mg(OH)_2$ was given. Serum gastrin also increased when the chloride analogues were given to each group, except after $MgCl_2$ in the control group. All the antacids caused a rise in serum gastrin in all groups and this rise was significantly higher than after the chlorides in most groups with most of the compounds. Serum gastrin concentrations rose significantly whenever intragastric pH was raised, and also after $MgCl_2$, $AlCl_3$, and $CaCl_2$ with a pH of 2, when the pH was not significantly altered. In control subjects, gastrin response was smaller than in the duodenal ulcer patients. Serum gastrin levels after $CaCl_2$ (pH 10) rose as much as after calcium carbonate, whereas after $CaCl_2$ (pH 2) the rise was much lower. The results suggest that administration of nonbuffering Mg-, Al-, and Ca-chlorides lead to elevated serum gastrin levels in duodenal ulcer patients, and rising intragastric pH exerts an additional gastrin response.

2004 INTRAVENOUS PENTAGASTRIN AS A PARTIAL AGONIST OF GASTRIC SECRETION IN MAN: EVIDENCE IN FAVOR OF THE EXISTENCE OF HORMONAL INHIBITORY SITES.

(E.) Prugh, M. F.; Schorr, B. A.; Vlahcevic, Z. R.; Makhlouf, G. M. (Med. Coll. Virginia, Richmond). *Gastroenterology,* 68(1):45-49, 1975.

The gastric secretory response to prompt i.v. injection of pentagastrin (0.125-0.75 μg/kg) was investigated in 6 male subjects (3 with duodenal ulcer and 3 normal). Each subject was tested with histamine acid phosphate (40 μg/kg s.c.). After injection with pentagastrin, the acid and pepsin concentrations rose to a peak in about 5 min and then declined to control levels in 30-40 min. The concentrations were higher in duodenal ulcer patients. The highest responses to pentagastrin and histamine were correlated. Sensitivity to pentagastrin, expressed in the D_{50}, was higher in duodenal ulcer patients. Unexpectedly, the highest response to pentagastrin was only 40% of the peak response to the s.c. histamine. Thus, i.v. pentagastrin acted as a partial agonist (i.e., that with this mode of administration a maximal response could not be attained) with an efficacy of about 0.4. The effect of prompt pentagastrin injection contrasted with the effect of slow i.v. infusion of the substance, as well as with the effects of gastrin-17 given either by prompt injection or slow infusion. The authors proposed that the secretory receptor for gastrin and its analogues consists of 2 sites: a high affinity stimulatory site and a low affinity inhibitory site. Partial agonism after prompt i.v. injection would result from blood and tissue transients which are successively too high (partially inhibitory) and low (stimulatory). The relative affinities for the 2 sites could explain the disparate effects of analogues and species differences.

2005 INTERACTION OF CHOLINERGIC FUNCTION WITH MG^{2+}-NA^{+}-K^{+}-DEPENDENT ATP-ASE SYSTEM OF CELLS IN THE HUMAN FUNDIC GASTRIC MUCOSA.

(E.) Mózsik, G.; Nagy, L.; Kutas, J.; Tárnok, F. (Univ. Med. Sch., Pećs, Hungary) *Scand. J. Gastroenterol.* 9(8): 741-745, 1974.

The Mg^{++}-Na^{+}-K^{+}-dependent ATP-ase system, which catalyzes the ATP into ADP, was biochemically prepared from human fundic gastric mucosa, and the effects of acetylcholine, carbamylcholine, neostigmine, and anticholinergics (atropine, isopropamide, and methyl-tropinium-bromide-xanthene-9-carboxylate) on this system were studied. A significant increase of total ATP-ase activity was caused by acetylcholine, carbamylcholine, and neostigmine. Acetylcholine caused an increase of Mg^{++}-dependent, total, and Na^{+}-K^{+}-dependent ATP-ase activity. Inhibition of total and Na^{+}-K^{+}-dependent activity was caused by atropine, while no inhibition was found on the Mg^{++}-dependent part alone. The inhibition of the transport ATP-ase by isopropamide and methyl-tropinium-bromide-xanthene-9-carboxylate were much less than that caused by atropine. Atropine prevented the effects of acetylcholine on the transport ATP-ase system. The stimulation or inhibition of this system by cholinergic or anticholinergic depended on the magnitudes of transport ATP-ase activity. This ATP-ase system may be a regulator of the effects of hormones and drugs in the human fundic gastric mucosa.

2006 MUCOUS CHANGE IN THE HUMAN DUODENUM: A LIGHT AND ELECTRON MICROSCOPIC STUDY AND CORRELATION WITH DISEASE AND GASTRIC ACID SECRETION.

(E.) Patrick, W. J. A.; Denham, D.; Forrest, A. P. M. (Dep. Clin. Surg., Univ. Edinburgh, Scotland) *Gut* 15(10):767-776, 1974.

The significance of mucous change in the human duodenum in a series of patients with peptic ulcer disease was studied using light and electron microscopy. Mucosal biopsies from areas clear of any recognizable pathological change were taken from the 1st part of the duodenum in 117 patients suspected of having peptic ulcer disease. Light microscopy revealed mucous changes in 68 of the 117 biopsies and these changes were found only in patients with peptic ulcers (with 1 exception). Mucous change was more frequent when the acid levels were greater than 30 mEq/hr, but there was no specific relationship between the extent of mucous change and gastric acid secretion. Additional biopsies from the edge of active ulcers showed greater mucous change. There was an increased prevalence of epithelial damage, acute inflammatory cell reaction, and villous and crypt atrophy associated with mucous change. It was demonstrated under electron microscopy that there was a continuity between the ducts of hyperplastic Brunner's glands and crypts containing mucous change with a transition zone with epithelial cells with features of both Brunner's glands and mucous change. Thus mucous cells may arise by transformation of Brunner's gland cells or as a distinctive population in the crypts. The mucous change is probably a protective mechanism involved in some way with the healing of ulcers.

2007 INFLUENCE OF FEEDING AND SHAM FEEDING UPON SERUM GASTRIN AND GASTRIC ACID SECRETION IN CONTROL SUBJECTS AND DUODENAL ULCER PATIENTS.

(E.) Mayer, G.; Arnold, R.; Feurle, G.; Fuchs, K.; Ketterer, H.; Track, N. S.; Creutzfeldt, W. (Dep. Med., Univ. Gottingen, Germany). *Scand. J. Gastroenterol.* 9(8):703-710, 1974.

The effect of feeding and a modified sham feeding procedure on gastric secretion and serum immunoreactive gastrin (IRG) concentrations in duodenal ulcer patients and in controls was studied. The investigations were performed in 19 controls, without known diseases of the gastrointestinal tract, and in 18 duodenal ulcer patients. Serum IRG increased significantly more, after a standard liquid meal (Vivasorb), in patients than in controls, while the fasting IRG levels did not significantly differ. A modifed sham feeding, where the subjects saw, tasted, chewed, and spat out an appetizing meal, stimulated gastric acid secretion in all subjects tested. The mean serum

IRG response of patients to modified sham feeding was significantly greater than the slight response of the controls. The increased IRG levels in patients could not be explained, and no correlation was found between the gastric acid response to modified sham feeding and the IRG output in patients and controls. The results suggest that acid secretion after vagal stimulation in man is mainly achieved by direct effects upon the parietal cells, and that vagally released IRG does not contribute significantly to the amount of acid secreted after vagal stimulation.

2008 INCREASED SENSITIVITY TO STIMULATION OF ACID SECRETION BY PENTAGASTRIN IN DUODENAL ULCER. *(E.)* Isenberg, J. I.; Grossman, M. I.; Maxwell, V.; Walsh, J. H. (VA Wadsworth Hosp. Cent., Los Angeles, Calif.). *J. Clin. Invest.*, 55(2):330-337, 1975.

Responsiveness of acid secretion to stimulation by pentagastrin was studied in 20 male duodenal ulcer patients and in 20 male patients without duodenal ulcer (controls). Dose-response studies were performed using graded doses of pentagastrin (2.7-6,000 ng/kg/hr). Differences in basal acid secretion between the 2 groups were not statistically significant. Each dose of pentagastrin (from 75-6,000 ng/kg/hr) produced significantly greater mean rates of acid secretion in the duodenal ulcer group than in the controls, and the highest observed response was greater in duodenal ulcer patients. The calculated maximal response (CMR) as determined by linear regression analysis, was greater in the duodenal ulcer group, while the dose for half maximal response was significantly less. By parallel line bioassay control subjects required 2.82 times more pentagastrin (95% confidence limits 2.12-3.74) than patients for equal response, expressed as percent of highest response. In neither group was there any significant correlation between sensitivity and basal acid output or highest observed response to pentagastrin. Thus duodenal ulcer patients not only secrete more acid in response to pentagastrin than patients without duodenal ulcer, a reflection of the greater parietal cell mass, but also are more sensitive to pentagastrin, requiring lower doses to achieve a certain fraction of maximal response. Several hypotheses were offered to explain this increased sensitivity, which may play a role in the pathogenesis of duodenal ulcer disease.

2009 INHIBITION OF Mg^{2+}-Na^{+}-K^{+}-DEPENDENT ATPase SYSTEM FROM HUMAN GASTRIC MUCOSA BY PROSTAGLANDINS E_1 AND E_2. *(E.)* Mozsik, G.; Kutas, J.; Nagy, L.; Nemeth, G. (Univ. Med. Sch., Pecs, Hungary). *Eur. J. Pharmacol.* 29(1):133-137, 1974.

2010 THE G CELL POPULATION OF THE GASTRIC ANTRUM, PLASMA GASTRIN, AND GASTRIC ACID SECRETION. *(E.)* Royston, C. M. S.; Polak, J. M.; Bloom, S.; Cooke, W. M.; Russell, C. R. C.; Pearse, A. G. E.; Baron, J. H.; Spencer, J.; Welbourn, R. B. (R. Postgrad. Med. Sch., London, England). *Gut* 15(10):840-841, 1974.

2011 A COMPARISON OF BASAL AND STIMULATED GASTRIC AND PANCREATIC SECRETION IN PATIENTS WITH AND WITHOUT DUODENAL ULCER DISEASE. *(E.)* Gutierrez, L. V.; Baron, J. H. (R. Postgrad. Med. Sch., London, England). *Gut* 15(10):836, 1974.

2012 A DUODENOSCOPIC STUDY OF THE RELATIONSHIP BETWEEN DUODENAL ULCER DEPTH AND GASTRIC ACID OUTPUT. *(E.)* Moshal, M. G. (King Edward VIII Hosp., Durban, South Africa). *S. Afr. J. Surg.* 12 (2):68-69, 1974.

2013 GASTROINTESTINAL COMPLICATIONS OF STRESS. *(Fr.)* Sibilly, A.; Boutelier, P. (Munic. Hosp., Strasbourg, France). *J. Chir. (Paris)* 108 (1/2):117-134, 1974.

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2015 BLEEDING PEPTIC ULCERS IN WORKERS FROM THE HEAT-TREATING SECTIONS OF A METALLURGICAL PLANT. *(Rus.)* Shuliak, L. P.; Demchenko, P. S.; Polishchuk, Iu. P. (Zaporozhe Med. Inst., USSR). *Klin. Khir.* (9):76-78, 1974.

2016 EPIDEMIOLOGICAL STUDY ON PEPTIC ULCER AND GASTRIC CANCER IN THE CHINESE. *(E.)* Sung, J. L.; Wang, T. H.; Lu, T. H.; Wu, S. C.; Hsu, T. W.; Lee, T. H. (Natl. Taiwan Univ. Hosp., Taipei). *Rend. Gastroenterol.* 6(2):111-115, 1974.

2017 BENIGN GASTRIC ULCERS OCCURING WITH PERSISTENT HISTAMINE-FAST ACHLORHYDRIA. *(E.)* Wald, A.; Burbridge, E. J. (Johns Hopkins Univ. Sch. Med., Baltimore, Md.). *Hopkins Med. J.* 135(6):436-441, 1974.

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2019 ANASTOMOTIC ULCERS. *(Rus.)* Podoprigora, A. P.; Nevmerzhitskii, V. M.; Miskov, A. P. (Shepetovka Cent. Reg. Hosp., Khmelnitska Reg., USSR). *Klin. Khir.* (9):71-72, 1974.

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2026 OBSERVER VARIATION IN THE ASSESSMENT OF RESULTS OF SURGERY FOR PEPTIC ULCERATION. *(E.)* de Dombal, F. T.; Horrocks, J. C.; Clamp, S. E. (Gen. Infirm., Leeds, England). *Gut* 15(10):824, 1974.

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2029 ENDOSCOPIC FINDINGS IN PATIENTS WITH OPERATED STOMACHS. *(Ger.)* Schmid, E.; Krautheim, J.; Blaich, E.; Oltmanns, D. (Reg. Hosp., Goppingen, Germany). *Z. Gastroenterol.* 12(1):29-30, 1974.

2030 THE ASSESSMENT OF FAILURES IN THE SURGICAL TREATMENT OF DUODENAL ULCER. *(Sp.)* Molins Benedetti, M.; Martinez Navarro, M.; Vila Planas, J. M. (no affil.). *An. Med. (Barc.)* 60(3):264-270, 1974.

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2032 SEQUELAE OF BILLROTH II GASTROENTEROSTOMY. *(Rus.)* Gevorkian, I. Kh.; Agadzhanian, G. I.; Balaian, R. A. (Erevan Med. Inst., USSR). *Klin. Khir.* (9):18-22, 1974.

2033 ROUX-EN-Y ANASTOMOSIS IN THE TREATMENT OF CHRONIC AFFERENT LOOP SYNDROME. *(E.)* Nielsen, O. V.; Jorgensen, S. P.; Pedersen, G. (Rigshosp., Univ. Copenhagen, Denmark). *Acta Chir. Scand.* 140(7):531-534, 1974.

2034 EARLY BILIOUS VOMITING AFTER GASTROENTEROSTOMY. *(E.)* Mathieson, A. J. M.; McDonald, C. W. E. (Bridge Earn Hosp., Perthshire, Scotland). *J. R. Coll. Surg. Edinb.* 19(4):216-221, 1974.

2035 EMPTYING OF THE SMALL INTESTINE BEFORE AND AFTER PEPTIC ULCER SURGERY. *(Rus.)* Siakerskii, A. G. (Irkutsk Med. Inst., USSR). *Klin. Khir.* (9):65-66, 1974.

2036 DISABILITY FOLLOWING GASTRECTOMY FOR PENETRATING GASTRIC AND DUODENAL ULCERS. *(Rus.)* Korolkova, L. N. (Chaliabinsk Med. Inst., USSR). *Klin. Khir.* (9):5-8, 1974.

2037 EVALUATION OF GASTRIC ACID SECRETION IN PATIENTS WITH DUODENAL ULCERS BEFORE AND AFTER VAGOTOMY AND PYLOROPLASTY. *(Rus.)* Satsukevich, V. N. (S. M. Kirov Mil. Med. Acad., Leningrad, USSR). *Klin. Khir.* (9):15-18, 1974.

2038 CHANGES IN CARBOHYDRATE METABOLISM PRODUCED BY TRUNCAL VAGOTOMY. *(Rus.)* Iarugskii, E. E. (Tashkent Med. Inst., USSR). *Klin. Khir.* (9):12-14, 1974.

2039 AN INTRA-OPERATIVE TEST FOR COMPLETENESS OF VAGOTOMY — I. THE GRASSI METHOD. *(E.)* van den Berg, W. P. J.; Bornman, P. C. (no affil.). *S. Afr. J. Surg.* 12(2):69-70, 1974.

See also, 1696, 1727, 1928, 2298, 2331, 2342, 2345, 2380.

2040 LYMPHOID HYPERPLASIA IN PATIENTS WITH DIARRHEA — MANIFESTATION OF IMMUNOLOGIC DISTURBANCES? *(Ger.)* Rosch, W.; Witzel, L.; Fuchs, H. F.; Fritsch, E. v. (Med. Clin. Polyclin., Univ. Erlangen-Nuremberg, Erlangen, Germany). *Leber Magen Darm* 3(1):29-34, 1973.

Immunological, histological, and therapeutic aspects of nodular lymphoid hyperplasia in diarrhea are presented in connection with 4 cases of obstinate and periodical diarrhea in 4 males (aged 19, 33, 34, and 30 yr). Lymphatic hyperplasia of the small intestine, IgA and IgM deficiency, and exudative enteropathy were diagnosed in a 19-yr-old patient with predisposition to diarrhea since infancy. Gluten-sensitive enteropathy, hypogammaglobulinemia, and lymphatic hyperplasia of the small intestine were found in another patient with diarrhea persisting for 2 yr. Agamma-globulinemia, subtotal atrophy of the villi of the small intestinal mucosa, and suspect follicular hyperplasia were diagnosed in another case persisting for 2 yr. A fourth patient showed giardiasis and follicular hyperplasia. Nodular lymphoid hyperplasia of the small intestine was characterized radiographically by numerous small filling defects which were uniform in size and contour. Hypogammaglobulinemia, agammaglobulinemia, gluten-sensitive enteropathy, giardiasis, as well as IgA and IgM deficiency are characteristic findings of diarrhea with lymphoid hyperplasia. Gluten free diet in isolated IgA deficiency, and antibiotics and gammaglobulin in agammaglobulinemia are indicated for therapy.

2041 THE PATHOLOGICAL PHYSIOLOGY OF SMALL INTESTINE. *(E.)* Masuda, M. (Kyoto Prefect. Univ. Med., Japan). *Jpn. J. Med.* 13(3):165-171, 1974.

2042 LIPOHYPERPLASIA OF THE ILEOCAECAL REGION. *(E.)* Axelsson, C.; Andersen, J. A. (Sundby Hosp., Copenhagen, Denmark). *Acta Chir. Scand.* 140(8):649-654, 1974.

2043 RARE CASES OF CONGENITAL SHORT BOWEL. *(Ger.)* Dumke, K.; Schnoy, N. (Westend Clin., Free Univ., Berlin, Germany). *Z. Gastroenterol* 12(5):321-325, 1974.

2044 MEMBRANE DIGESTION IN THE FUNCTIONAL DIAGNOSIS OF THE SMALL INTESTINE. *(Rus.)* Zlatkina, A. R.; Misautova, A. A.; Makievskaia, S. E.; Kutychkina, O. A. (M. F. Vladimirskii Reg. Clin. Res. Inst., Moscow, USSR). *Klin. Med. (Mosk.)* 52(11):106-110, 1974.

2045 ERRORS IN THE DIAGNOSIS AND TREATMENT OF CLOSED INTESTINAL TRAUMA. *(Rus.)* Rarenko, A. S. (Krasnodon Cent. Munic. Hosp., USSR). *Klin. Khir.* (8):36-38, 1974.

2046 INTRAABDOMINAL ISCHEMIA. *(Ger.)* Baas, E. U. (1st Med. Clin., Johannes Gutenberg Univ., Mainz, Germany). *Therapiewoche* 22(24):2513-2522, 1974.

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2048 LATE RADIATION DAMAGE IN THE SMALL AND LARGE INTESTINE. *(Ger.)* Lenner, V. (Surg. Clin., Univ. Mainz, Germany). *Therapiewoche* 24(18):2055-2061, 1974.

2049 THE VALUE OF ENDOSCOPIC EXAMINATION IN THE DIAGNOSIS OF DUODENITIS. *(Ger.)* Cheli, R.; Aste, H.; Ciancamerla, G. (San Martino Hosp., Genoa, Italy). *Z. Gastroenterol.* 12(1):41, 1974.

2050 EROSIVE DUODENITIS. *(Rus.)* Smagin, V. G.; Sokolov, L. K.; Gavrilenko, Ia. V.; Zotov, V. M.; Ivanov, V. V. (4th Dep. Ministry Health, Moscow, USSR). *Klin. Med. (Mosk.)* 52(7):93-94, 1974.

2051 SMALL INTESTINE PERFORATION AS A COMPLICATION OF TYPHOID FEVER. *(Ser.)* Tomanovic, A.; Baljosevic, S.; Moracic, B.; Gigic, A.; Ristic, T.; Slavkovic, G. (Gen. Hosp., Pristina, Yugoslavia). *Vojnosanit. Pregl.* 31(4):239-241, 1974.

2052 THE SCINTIGRAPHIC DETECTION OF THE DIVERTICULUM OF MECKEL: A RARE BUT INTERESTING ISOTOPIC EXPLORATION PROCEDURE IN GASTRO-ENTEROLOGY. *(E.)* De Somer, E.; Boeckx, L.; De Roo, M. J. K.; Kerremans, R.; Frijns, J. P. (St. Rafael Acad. Hosp., Cathol. Univ., Louvain, Belgium). *J. Belge Radiol.* 57(3):179-184, 1974.

2053 DUODENAL DIVERTICULUM WITH INTERMITTENT BILIARY STASIS. *(E.)* Solhaug, J. H.; Semb, B. K. H. (Dep. Surg., Univ. Bergen, Norway). *Acta Chir. Scand.* 140(8):670-673, 1974.

2054 SURGICAL TREATMENT OF A DUODENAL DIVERTICULUM LOCATED INSIDE THE PANCREAS. *(Rus.)* Mikhailichenko, A. F. (Cent. Reg. Hosp., Crimean Reg., USSR). *Klin. Khir.* (9):75, 1974.

2055 EARLY POSTOPERATIVE INTESTINAL OBSTRUCTION DUE TO ADHESIONS. *(Rus.)* Toropov, Iu. D. (M. Gorky Inst. Postgrad. Med., Zaporozhe, USSR). *Klin. Khir.* (8):22-26, 1974.

2056 THE SITE AT WHICH THE SMALL INTESTINE IS RESECTED IN ACUTE OBSTRUCTION. *(Rus.)* Kolibaba, S. S. (N. I. Pirogov Med. Inst., Vinnitsa, USSR). *Klin. Khir.* (8):30-33, 1974.

2057 RARE FORM OF INTESTINAL OBSTRUCTION. *(Rus.)* Seniutovich, V. F.; Shevchuk, M. G.; Ostapenko, E. A. (Ivano-Frankovsk Med. Inst., USSR). *Klin. Khir.* (8):58-59, 1974.

2058 DOUBLE PRIMARY CANCERS OF THE SMALL INTESTINE AND THE STOMACH: REPORT OF A CASE. *(E.)* Matsuo, T.; Yao, T.; Miyasaki, K. (Hyogo Prefect. Awaji Hosp., Sumoto, Japan). *Kobe J. Med. Sci.* 20(3/4)97-102, 1974.

2059 INTUSSUSCEPTION CAUSED BY A LYMPHOMA IN CHILDHOOD: ONE CASE IN AN EIGHT-YEAR-OLD BOY. *(Sp.)* Vilaseca, J.; Garnacho, A.; Llorens, V.; Blanes, R.; Bonafonte, M.; Mari, L. (Munic. Social Welfare Hosp., Barcelona, Spain). *Rev. Esp. Enferm. Apar. Dig.* 44(6):605-612, 1974.

2060 RETICULUM CELL SARCOMATOSIS OF THE SMALL INTESTINE. *(Rus.)* Bakhtiiarov, V. A. (Kemerovo Med. Inst., USSR). *Klin. Khir.* (10):44-45, 1974.

2061 CYSTIC LYMPHANGIOMA OF THE MESENTERY OF THE SMALL INTESTINE IN A CHILD. *(Rus.)* Stetskiv, O. V. (Ichnia Cent. Reg. Hosp., Chernigov Reg., USSR). *Klin. Khir.* (11):85-86, 1974.

2062 LYMPHOSARCOMA OF THE SMALL INTESTINE. *(Rus.)* Podoprigora, A. P. (Shepetovka Cent. Reg. Hosp., USSR). *Khirurgiia (Mosk.)* (3): 114-116, 1973.

2063 PROLONGED SURVIVAL IN A PATIENT WITH LYMPHOSARCOMA OF THE SMALL INTESTINE TREATED WITH COMBINED THERAPY. *(Rus.)* Budarina, E. M.; Kopevalov, R. V. (S. M. Kirov Med. Inst., Gorki, USSR). *Klin. Khir.* (10):46-47, 1974.

2064 CLINICAL SURVEY OF THE PATIENTS WITH MASSIVE RESECTION OF SMALL INTESTINE DURING THE LAST TEN YEARS. *(E.)* Chen, K. M. (Coll. Med., Natl. Taiwan Univ. Taipei). *J. Formosan Med. Assoc.* 73(1):35-44, 1974.

2065 DIET AND GROWTH AFTER RESECTION OF ILEUM IN CHILDHOOD. *(E.)* Valman, H. B. (Northwick Park Hosp., Harrow, England). *Gut* 15(10):822, 1974.

2066 DECREASE OF CALCIUM-BINDING PROTEIN IN THE SMALL INTESTINAL MUCOSA IN UREMIC PATIENTS WITH RENAL OSTEODYSTROPHY. *(Ger.)* Piazolo, P. J.; Hotz, J.; Helmke, K.; Franz, H. E.; Goebell, H. (Cent. Intern. Med. Pediatr., Univ. Ulm, Germany). *Z. Gastroenterol.* 12(4):273-276, 1974.

See also, 1675, 1885, 1891, 1892, 1898, 1899, 1936, 1957, 2023, 2127, 2147, 2294, 2325, 2366, 2389, 2394.

SMALL INTESTINE

Malabsorption

2067 THE SMALL-INTESTINAL MUCOSA IN COW'S MILK ALLERGY. *(E.)* Shiner, M.; Ballard, J.; Smith, M. E. (Cent. Middlesex Hosp., London, England). *Lancet* 1(7899):136-140, 1975.

Two infants (1 boy and 1 girl, aged 6-8 weeks) were investigated for allergy to cow's milk protein. The initial biopsies of both patients seemed normal, but subsequent biopsies showed the presence of shortened, broader villi which were in part convoluted. In the male patient, before receiving milk, the epithelium microvilli, lysosomes, mitochondria and golgi were normal. The sub-epithelium basement membrane and connective tissue were thickened. The appearance of the inflammatory cells was normal for mast cells and plasma cell activity; eosinophils and polymorphs were absent. After receiving milk, edema in the connective tissue, and an increase in the plasma cell activity were noted in the sub-epithelium. For the infant girl, the initial biopsy differed from the boy only in that the sub-epithelium basement membrane appeared normal with some edema noted in connective tissue before milk was given. After milk was given, the biopsy showed by electron microscopy that in the epithelium, the microvilli were irregular, lysosomes increased, mitochondria were damaged, and golgi were active; for the sub-epithelium connective tissues patchy edema and coarsening of fibers (collagen?) were noted; and the mast cells, plasma cell activity, eosinophils and polymorphs were increased with the mast cells appearing degranulated. Plasma-cells producing IgG, IgM, and IgE were slightly increased in the boy's 1st biopsy. After milk there was a further increase in IgM and IgE plasma-cells, but little change in IgA and none in IgG cells or in complement. Basement membrane and connective tissue fluorescence were noted with IgG, IgE, and IgA antisera. The initial biopsy specimen from the infant girl showed a normal staining pattern of plasma-cells, but there was patchy membrane staining with antisera to IgE and C3. A striking increase in mucosal IgM and IgE plasma-cells associated with staining of the epithelial brush borders and inter-epithelial spaces 11 1/2 hr after milk suggests that these immunoglobulins are secreted into the bowel lumen. Connective-tissue staining with antisera to IgG and C3 was also increased, but no change in IgG or IgA plasma-cells was noted. These studies indicate that, after ingestion of cow's milk by infants allergic to milk proteins, reaginic immune reactions occur in the small intestinal mucosa. These findings may provide a sound basis for diagnosis of such an allergy and for the treatment of similar patients with disodium cromoglycate.

2068 IDENTIFYING TOXIC FRACTIONS OF WHEAT GLUTEN AND THEIR EFFECT ON THE JEJUNAL MUCOSA IN COELIAC DISEASE. *(E.)* Dissanayake, A. S.; Jerrome, D. W.; Offord, R. E.; Truelove, S. C.; Whitehead, R. (Radcliffe Infirm., Oxford, England). *Gut* 15(12):931-946, 1974.

The toxicity of 3 fractions (A, B, and C) obtained by ultrafiltration of a peptic:tryptic digest of gluten was assessed by serial feeding experiments in 3 patients with treated celiac disease. One patient evidenced no clinical features of a reaction to the feeding. A second patient began having symptoms about the 4th day and these persisted over 3 weeks after the challenge. The symptoms were mild and consisted of malaise, occasional upper abdominal discomfort, and mild diarrhea. The third patient noted symptoms about 5 hr after a large single dose of fraction B. Generalized abdominal discomfort, distention and vomiting occurred. All symptoms passed by 24 hr. No consistent changes occurred in any patient in routine blood investigations. The first fraction, A, contained amino acids and oligopeptides and produced no damage to the jejunal mucosa. The other 2 fractions both caused mucosal damage. Fraction B contained the products of digestion of smaller molecular weight, polypeptides in the region of 8000 molecular weight. Thus it contained no gliadin or gluten. Ultrastructural evidence of damage was visible 6 hr after challenge with fraction B, and by 10 hr histological abnormalities were also present. Ultrastructural abnormalities occurred early in the epithelial cells and preceded changes in the basement membrane and capillaries. In all 3 patients the disaccharidases in the initial biopsy were within normal limits. In one patient no change in enzyme content was noted at 6 hr, but by 24 hr, a precipitous fall had occurred with all 3 enzymes which continued to fall over the next 2 days. In a second patient the jejunal disaccharidases were reduced at 10 hr and fell further by 24 hr. In a third patient a similar but more marked fall occurred after 9 hr with a single large dose of fraction B. Enzymes were lower at 24 hr, but by 72 hr there was evidence of enzyme recovery. It is concluded from this study that the rapid onset of damage after challenge, coupled with the evidence of recovery as early as 72 hr later, is more in keeping with a direct action on the surface epithelial cells rather than an immune mechanism.

2069 ULTRASTRUCTURAL FEATURES OF ACRODERMATITIS ENTEROPATHICA. *(Ger.)* Lombeck, I.; von Bassewitz, D. B. (Pediatr. Clin., Univ. Dusseldorf, Germany). *Monatschr. Kinderheilk.* 122(7):661-662, 1974.

Electron microscopic examinations were performed on biopsies from the small intestine of a 13-month-old boy with acrodermatitis enteropathica. Biopsies were taken before institution of therapy and 6 weeks and 7 and 12 months thereafter. Therapy consisted of unboiled breast milk combined, 4 weeks later, with iodochlorhydroxyquin (750 mg/day). Before therapy, atypical inclusions were found in Paneth's cells. These inclusions were oval or rhomboid and, in most cases, larger than the acidophilic granules. They consisted of electron-dense material surrounded by less dense material with a fibrous structure. The rest of the intestinal epithelium appeared normal except for the absence of some microvilli and infiltration of the lamina propria by granulocytes, lymphocytes, eosinophils, macrophages, and mast cells. Although clinical improvement occurred and inflammatory changes in the small intestine regressed with therapy, the inclusions in Paneth's cells persisted in the next 3 biopsies. Examinations performed under the light microscope disclosed regeneration of the villi after 6 months of therapy and complete normalization of the villi after 12 months. When the boy was 21 months old, a normal diet was gradually introduced. However, drug treatment is being continued since the child developed a recurrence of symptoms when iodochlorhydroxyquin was discontinued at age 30 months.

2070 MEGADUODENUM. A CASE WITH BACTERIAL OVERGROWTH, DECONJUGATION OF BILE SALTS, MALABSORPTION, AND POLYNEUROPATHY. *(E.)* Matzen, P.; Davidsen, D.; Mathiasen, M. S. (Marselisborg Hosp., Aarhus, Denmark). *Scand. J. Gastroenterol.* 9(7): 645-650, 1974.

A case history is reported of a 50-yr-old man suffering from severe duodenal dilatation and stasis proximal to the crossing of the intestine by the superior mesenteric artery, as well as from malabsorption. For 6 months prior to hospital admission the patient had 3-4 voluminous, gray, fatty stools/day and a weight loss of about 10 kg. In the last few weeks before admission appetite decrease was accompanied by increasing epigastric pain and voluminous vomiting. On admission the abdomen was distended with a tender doughy mass in the epigastrium. Roentgenographic examination of the stomach and duodenum and hypotonic duodenography in combination with angiography of the superior mesenteric artery revealed an extremely dilated duodenum with retention orally to an impression in the horizontal part of the duodenum, in which the superior mesenteric artery was demonstrated. On aerobic culture of the duodenal aspirate, 10^6 colonies *Klebsiella pneumoniae*/ml and 5×10^4 colonies nonhemolytic streptococci were found. On breath test, where glycine-1-^{14}C-cholic acid was administered p.o., 0.41% ^{14}C was recovered in the expiratory air carbon dioxide (normal $< 0.10\%$), whereas 2% ^{14}C was excreted in the feces (normal $< 7\%$), indicating premature deconjugation of bile salts in the upper small intestine, but intact reabsorption of bile salts in the terminal ileum. During the course of the condition, polyneuropathy had developed which could not be explained by folic acid, B_{12}, or thiamine deficiency but was possibly due to deficiency of another essential nutrient factor. The patient was treated with nasogastric suction and parenteral fluid, electrolytes, and nutrition but his condition deteriorated. A duodenojejunostomy was performed but the patient died postoperatively from mesenteric thrombosis. Although long-term treatment with antibiotics has been suggested in other publications, the authors prefer operative treatment in cases of megaduodenum with malabsorption due to abnormal bacterial flora. Despite the outcome of this case, it is suggested that duodenojejunostomy is the operation of choice.

2071 THE HL-A SYSTEM AND THE IMMUNOLOGICAL RESPONSE TO DIETARY ANTIGENS. *(E.)* Scott, B. B.; Swinburne, L. M.; Rajah, S. M.; Losowsky, M. S. (St. James's Univ. Hosp., Leeds, England). *Gut* 15(10):823, 1974.

2072 TISSUE DAMAGE MEDIATED BY LYMPHOCYTES IN LOCAL SMALL INTESTINAL IMMUNE REACTIONS. *(E.)* Ferguson, A.; McDonald, T. T. (Dep. Bacteriol. Immunol., Univ. Glasgow, Scotland). *Gut* 15(10):834, 1974.

2073 CLINICAL SIGNIFICANCE OF DISORDERS IN DISACCHARIDE HYDROLYSIS AND ABSORPTION IN THE SMALL INTESTINE. *(Rus.)* Levin, A. A. (Leningrad Med. Inst. Sanit. Hyg., USSR). *Klin. Med. (Mosk.)* 52(8):33-36, 1974.

2074 GASTROJEJUNOCOLONIC FISTULA, BLIND-LOOP SYNDROME, AND STEATORRHEA. *(Sp.)* de la Santa Lopez, J.; Velloso Jimenez, A.; Hernandez Pascual, A.; Belda Laguna, O. (Virgin del Rocio Munic. Hosp., Seville, Spain). *Rev. Esp. Enferm. Apar. Dig.* 44(5):493-508, 1974.

2075 MALABSORPTION SYNDROME. *(Ger.)* Ewe, K. (1st Med. Clin., Johannes Gutenberg Univ., Mainz, Germany). *Therapiewoche* 24(22):2522-2534, 1974.

2076 HYPOGAMMAGLOBULINEMIA IN PATIENTS WITH MALABSORPTION SYNDROME. *(Rus.)* Kuvaeva, I. B.; Vinogradova, M. A.; Temkina, T. Ia.; Kamaeva, N. G.; Makeeva, A. A. (All-Union Res. Inst. Gastroenterol., Moscow, USSR). *Klin. Med. (Mosk.)* 52(8):124-131, 1974.

2077 MALABSORPTION IN AFRICA. *(E.)* Cook, G. C. (Dep. Med., Univ. Zambia, Lusaka). *Trans. R. Soc. Trop. Med. Hyg.* 68(6):419-435, 1974.

2078 LACTOSE INTOLERANCE CAUSED BY LACTASE DEFICIENCY. *(Fr.)* Duchier, J. (Hotel Dieu, Paris, France). *Arch. Fr. Mal. App. Dig.* 63(6):513-531, 1974.

2079 THE INHERITANCE OF SELECTIVE ADULT-TYPE LACTOSE MALABSORPTION. *(E.)* Sahi, T. (Dep. Public Health Sci., Univ. Helsinki, Finland). *Scand. J. Gastroenterol. [Suppl.]* 9(30):73 pp., 1974.

2080 LACTOSE MALABSORPTION IN CHILDREN WITH CHRONIC NONSPECIFIC DIARRHEA (IRRITABLE COLON). *(Sw.)* Norstedt, S. (no affil.). *Lakartidningen* 71(21):2181-2182, 1974.

2081 DRUG-INDUCED MALABSORPTION OF VITAMIN B_{12}. VII. MALABSORPTION OF B_{12} DURING TREATMENT WITH POTASSIUM CITRATE. *(E.)* Palva, I. P.; Salokannel, S. J.; Palva, H. L. A.; Rytokonen, U.; Timonen, T. (Dep. Med., Univ. Kuopio, Finland). *Acta Med. Scand.* 196(6):525-526, 1974.

2082 INTESTINAL IRON ABSORPTION UNDER THE INFLUENCE OF AVAILABLE STORAGE IRON AND ERYTHROBLASTIC HYPERPLASIA. COMPARATIVE STUDIES IN CHILDREN WITH HEREDITARY SPHEROCYTOSIS, NONSPHEROCYTIC ENZYMOPENIC HEMOLYTIC ANEMIA, ACQUIRED HEMOLYTIC ANEMIA, VITAMIN B_{12} DEFICIENCY INDUCED MEGALOBLASTIC ANEMIA, ERYTHROBLASTIC HYPERPLASIA AND APLASTIC ANEMIA. *(E.)* Bender-Gotze, C.; Heinrich, H. C.; Gabbe, E. E.; Oppitz, K. H.; Schafer, K. H.; Schroter, W.; Whang, D. H. (Hamburg-Eppendorf Univ. Hosp., Hamburg, Germany). *Z. Kinderheilkd.* 118(4):283-301, 1975.

2083 TROPICAL SPRUE IN RHODESIA. *(E.)* Thomas, G. E.; Clain, D. J. (Dep. Med., Univ. Rhodesia, Salisbury). *Gut* 15(10):823, 1974.

2084 HISTOCOMPATIBILITY ANTIGENS IN COELIAC DISEASE. *(E.)* Ferguson, R.; Asquith, P.; Cooke, W. T. (Gen. Hosp., Birmingham, England). *Gut* 15(10):834, 1974.

2085 FAMILY STUDY OF COELIAC DISEASE. *(E.)* Rolles, C. J.; Kyaw Myint, T. O.; Sin, W. K.; Anderson, C. M. (Inst. Child Health, Univ. Birmingham, England). *Gut* 15(10):827, 1974.

2086 THE PREVALENCE OF COELIAC DISEASE AND CYSTIC FIBROSIS IN IRELAND, SCOTLAND, AND ENGLAND AND WALES. *(E.)* O'Reilly, D.; Murphy, J.; McLaughlin, J.; Bradshaw, J.; Dean, G. (Dep. Med., Univ. Coll., Cork, Ireland). *Int. J. Epidemiol.* 3(3):247-251, 1974.

2087 EVIDENCE OF IMMUNODEFICIENCY IN PATIENTS WITH COELIAC DISEASE. *(E.)* Baker, P. G.; Jones, J. V.; Peacock, D. B.; Read, A. E. (Dep. Med., Univ. Bristol, England). *Gut* 15(10):835, 1974.

2088 ENTERIC LOSS OF LYMPHOCYTES IN COELIAC DISEASE AND IN CROHN'S DISEASE. *(E.)* Weetman, A. P.; Haggith, J.; Douglas, A. P. (R. Victoria Infirm., Newcastle upon Tyne, England). *Gut* 15(10):823, 1974.

2089 CONTINUING GLUTEN INGESTION AND ITS DETECTION IN TREATED COELIAC PATIENTS. *(E.)* Baker, P. G.; Read, A. E. (Bristol R. Infirm., England). *Gut* 15(10):827, 1974.

2090 LIGHT AND ELECTRON MICROSCOPE STUDIES OF SMALL INTESTINE BIOPSIES IN ACRODERMATITIS ENTEROPATHICA. *(Ger.)* Heilmann, K.; Rossner, J. A.; Braun, O. (Munic. Hosp., Pforzheim, Germany). *Verh. Dtsch. Ges. Pathol.* 57:450, 1973.

See also, 1834, 2001, 2252, 2349.

LARGE INTESTINE

2091 EFFECT OF DIET ON HUMAN FECAL FLORA: COMPARISON OF JAPANESE AND AMERICAN DIETS. *(E.)* Finegold, S.; Attebery, H. R.; Sutter, V. L. (VA Wadsworth Hosp. Cent., Los Angeles, Calif.). *Am. J. Clin. Nutr.* 27(12):1456-1469, 1974.

The composition of fecal flora was compared in 18 Japanese Americans living on a Western diet and 15 living on a traditional Japanese diet. The 2 groups were comparable in sex distribution and number of daily bowel movements, but there was a statistically significant age difference, those on the traditional diet being an average of 19.0 yr older. Significant differences were found in the following species of intestinal flora (figures represent mean count $\log_{10}$ number of organisms/g feces in Japanese diet and Western diet, resp.): *Eubacterium contortum* (9.58, 0), *E. lentum* (10.20, 10.07), *Bifidobacterium infantis* and other species (0, 10.29), *Peptostreptococcus species 1* (10.53, 0), *Peptostreptococcus species 1-25* (8.29, 4.64), *Streptococcus faecalis faecalis* (9.83, 8.46), and other facultative or aerobic organisms (7.20, 4.75). No statistically significant differences were found with *Clostridium paraputrificum* or other clostridia believed to modify bile acids into carcinogens. In all, 220 distinct species, subspecies, and groups were recovered from the subjects on the Japanese diet, and over 160 from those on the Western diet. It is concluded that diet may play a significant role in determining fecal floral composition, and that further study is indicated.

2092 CHROMOSOME BANDING PATTERN IN HUMAN COLONIC POLYPS. *(E.)* Mitelman, F.; Mark, J.; Nilsson, P. G.; Dencker, H.; Norryd, C.; Tranberg, K. G. (Univ. Hosp., Lund, Sweden). *Hereditas* 78(1):63-68, 1974.

Chromosomal studies were compared between polyps from a patient with familial polyposis and sporadic adenomas from different patients with no familial polyposis. Five polyps were taken from the patient with the familial history and 4 from the sporadic cases. All were about 5 mm in diameter and were subjected to histological and chromosomal analysis. In the sporadic polyps, the normal diploid complement was predominant. In 2, no deviations in chromosome number were found; in 1, 1 hypodiploid cell was found; and in another, 5 of 23 cells had abnormal chromosome numbers. In contrast, all of the cells from the 5 polyps of the familial patient had deviations. In 3, deviant karyotypes were predominant, and in 1, no normal cells were found. G-band analysis showed that of 26 cells with a deviating karyotype all showed engagement of 1 of the C (chromosome 8 in 7 cells) and/or D (chromosome 14 in 8 cells) group chromosomes. Histologically, all the polyps were benign adenomas showing no sign of invasiveness. It is concluded that chromosomal changes occur before histologic evidence of invasiveness in the oncogenic process.

2093 THE OCCULT OSTEOMATOUS CHANGES IN THE MANDIBLE IN PATIENTS WITH FAMILIAL POLYPOSIS COLI. *(E.)* Utsunomiya, J.; Nakamura, T. (Tokyo Med. Dent. Univ., Japan). *Br. J. Surg.* 62(1):45-51, 1975.

Radiological examinations were made of the oral region in patients with familial polyposis coli (FPC) to determine the possible association of FPC with osteoma in the mandible. Routine medical examination of all the cases was done, with emphasis on radiology of the gastrointestinal tract, fiberscopy of the stomach and colon, palpation and inspection of the body surface, systemic bone survey and anamnesis of tumor removal, plus routine dental and oral radiological examinations. Radio-opaque lesions (characteristic of endosteoma) were detected in the mandibular bone in 27 of 29 cases in 15 families with FPC (21 cases without Gardner's stigmata, 7 cases with the incomplete syndrome, 1 case with the complete syndrome); 35.7% of the cases also showed impacted teeth. The occult (thought to correspond to central osteoma or endosteoma) osteomatous changes described are considered a useful finding for early detection of the polyposis carrier in the FPC family and provide further understanding of Gardner's syndrome; they also indicate that FPC has the potential to produce a variety of neoplastic lesions other than the colonic lesion.

2094 OCCURRENCE OF ATYPICAL CHANGES IN COLORECTAL POLYPS ACCORDING TO THE FAMILIAL HISTORY OF GASTRO-INTESTINAL TRACT MALIGNANCIES. *(E.)* Crespi, M.; Bigotti, A.; Di Matteo, S.; Casale, V. (Regina Elena Inst. Cancer Res., Rome, Italy). *Proc. Fifth Int. Symp. Biol. Characterization Hum. Tumors, Bologna, April 4-6, 1973* 1:269-275, 1974.

Nineteen hundred forty eight cases were selected out of 19,000 individuals for proctocoloscopy on the basis of 3 parameters: suspicious digital examination, occult blood in the stools, or suspicious personal or family history. An 8.8% incidence of polypoid lesions was found, 24.6% being greater than 1 cm in diameter and 75.4% being smaller. Thirteen adenocarcinomas were found, all in Duke stage A. Presence of occult blood in the stools was found to be an invalid criterion, due to false positives from hemorrhoidal involvement. Digital examination was able to detect growths as small as 3 mm in diameter. The incidence of atypical changes in adenomatous polyps was significantly higher in patients with suspicious family histories. Of 74 cases of adenoma, a 58% incidence of atypical changes were found in polyps under 1 cm in diameter in contrast to a 14% incidence in controls; in polyps over 1 cm a 66% incidence was found compared with 25% in controls. No definite conclusions are drawn, but digital examination, and especially family history may prove valuable as screening criteria.

2095 THE ANATOMIC PRECURSOR OF COLORECTAL CARCINOMA.

(E.) Fenoglio, C. M.; Lane, N. (Presbyt. Hosp., New York, N.Y.). *JAMA* 231(6):640-642, 1975.

Colorectal polyp anatomy and malignant potential is briefly reviewed. Polyps are defined as any visible protrusion on the colorectal mucous membrane. Hyperplastic polyps account for about 90% of all polyps and appear as minute (1-5 mm) dewdrop elevations. They result from increase in cell division in the lower parts of the crypts of Lieberkuhn, and are not neoplastic. Adenomas, in contrast, are benign neoplasms, and occur in 2 major forms, pedunculated and sessile, although they can occur in all shapes and sizes. They represent a serious disturbance of cellular renewal in which unrestricted mitosis takes place at all tissue levels and does not result in complete differentiation. Carcinomas tend to arise in pedunculated adenomas over 1.5 cm in diameter (10% frequency) and in sessile papillary or villous adenomas over 5 cm in diameter (30% frequency). These are only clinically significant when they become invasive (i.e. they penetrate the muscularis mucosae). Of every 1000 polyps, 900 are hyperplastic, 90 are under 1.5 cm, and of the remaining 10, 1 will have an invasive carcinoma. Evidence indicates that carcinomas do not arise *de novo* from normal mucosa without an adenomatous stage.

2096 RECTAL CARCINOMA: A TWO PART STUDY OF TUMOUR PROLIFERATION AND HOST CELLULAR IMMUNITY.

(E.) Bone, G.; Camplejohn, R. S. (R. Victoria Infirm., Newcastle upon Tyne, England). *Am. J. Proctol.* 26(1):65-76, 1975.

Tumor proliferation and host cellular immunity were studied in patients with rectal adenocarcinoma. In a proliferation study, 19 patients were given the stathmokinetic drug vincristine sulfate (0.045 mg/kg). Biopsies of both normal mucosa and tumor were fixed, stained and counted for cells in mitosis. Cell cycle time for tumors was calculated at 192 hr, metaphase time at 2.0 hr, and total mitotic time at 2.3 hr. Comparison with normal mucosa showed that tumors had a lower fraction of the cell population proliferating, and exhibited a reduction in cell loss from 100% (normal) to 98.7%. An immunity study investigated the relation between host immunity and tumor proliferation and spread. Twenty-one of 40 patients were given proliferation studies, and were divided on a histological basis into well-differentiated, moderately well-differentiated, and poorly differentiated tumors. The patients were given skin tests for sensitivity to 2,4-dinitro-1-chlorobenzene and divided into groups sensitive to only 200 μg, to 100 μg, to 40 μg, or to 2 μg. Pathological grading of the patients was also done according to Duke's classification of degree of tumor spread. A significant positive correlation was found between competence in response to 2,4-dinitro-1-chlorobenzene and decreasing spread of the tumor. No correlation was found between proliferation rates and competent cellular immunity. It is concluded that cell-mediated immunity has no effect on proliferation of rectal carcinomas, since they proliferate by decreased cell loss, but there is an inverse relationship between tumor spread and host immunity.

2097 PROGNOSTIC EVALUATION OF REGIONAL LYMPH NODE MORPHOLOGY IN COLORECTAL CANCER.

(E.) Tsakraklides, V.; Wanebo, H. J.; Sternberg, S. S.; Stearns, M.; Good, R. A. (Mem. Sloan-Kettering Cancer Cent., New York, N.Y.). *Am. J. Surg.* 129(2): 174-180, 1975.

Histological patterns of regional lymph nodes were studied with relation to prognosis in 143 patients with left-sided colorectal adenocarcinoma. The degree of infiltration of the tumor was classified into 3 stages, and the lymph node histologic patterns into 4 types: lymphocyte predominance, germinal center predominance, lymphocyte depletion, and unstimulated. Of these types, 20% had lymphocyte predominance, 41% had germinal center predominance, none had lymphocyte depletion, and 39% had unstimulated. Five yr survival rates were 71% for germinal center predominance, and 54% for lymphocyte predominance, and unstimulated, the difference not statistically significant. In contrast, survival rates were 82%, 62%, and 47%, resp., among the 3 groups classified according to the stage of tumor infiltration. It is concluded that in cancer of the colon, prognosis is not correlated with regional lymph node morphology, but with extent of the disease.

2098 ROLE OF SERIAL PLASMA C.E.A. ASSAYS IN DETECTION OF RECURRENT AND METASTATIC COLORECTAL CARCINOMAS.

(E.) Mackay, A. M.; Patel, S.; Carter, S.; Stevens, U.; Laurence, D. J. R.; Cooper, E. H.; Neville, A. M. (R. Cancer Hosp., London, England). *Br. Med. J.* 4(5941):382-385, 1974.

Serial estimations of plasma carcinoembryonic antigen (CEA) levels have been carried out in 220 patients with colorectal carcinomas who had potentially and apparently curative resections. Of these patients, 167 were considered well and without clinical evidence of recurrent disease. In 150 of the 167 patients the plasma CEA levels remained in the normal range throughout the follow-up period. In the remaining 17, progressively rising titers exceeding 40 ng/ml were observed. In the remaining 53 of the 220 patients, either recurrent or metastatic tumors or both developed during the assessment period. In 26 of these, clinical detection of recurrent tumors was preceded by plasma CEA titers rising to pathological levels. In a further 10, rising titers were noted synchronously with the clinical detection of the tumor. In 17 patients, no change in CEA levels occurred in association with the clinical re-establishment of recurrent or metastatic tumor. The interval between the occurrence of levels of plasma CEA in excess of 40 ng/ml and the clinical detection of recurrence or metastasis was commonly around 9 months, although in one case this period was 18 months. The site of the metastases influenced whether raised plasma CEA values would develop or not. Most subjects with hepatic secondary tumors had raised levels. Raised levels were less likely with pelvic and peritoneal metastases and were highly unlikely in cases of local recurrence. The precise preoperative CEA level in plasma did not act as a clear prognostic index with regard either to the incidence of recurrences or the free interval before their detection. Dukes's staging remained a more accurate index. However, within any particular Dukes's stage, there was a tendency for the higher plasma values to carry a worse prognosis. Of greater importance was the postoperative failure of CEA levels to return to normal, which indicated spread outside the apparent pathological stage and a high and early rate of recurrence. Use of serial plasma CEA assays is recommended as an aid for the earlier detection of recurrent or metastatic colorectal carcinomas.

2099 INVASIVE AND METASTASIZING CARCINOMA IN A SMALL ADENOMATOUS POLYP OF THE COLON: REPORT OF A CASE WITH DEMONSTRATION OF A TUMOR ASSOCIATED ANTIGEN. *(E.)* Strauss, R. A.; Pascal, R. R. (Presbyt. Hosp., New York, N.Y.). *Hum. Pathol.* 6(2): 256-259, 1975.

An unusual case of metastasis of a carcinoma arising from an adenomatous polyp, without invasion of the pedicle, is presented. A 40 yr old woman presented with rectal bleeding. Sigmoidoscopy revealed a pedunculated lesion about 1 cm in diameter, 15 cm from the anal verge. A 0.3 cm portion of the head was removed, and examination showed a focus of moderately differentiated adenocarcinoma penetrating into the muscularis mucosae. A 30 cm segment of sigmoid colon was removed, on which a solitary polyp, 1.7 cm in diameter, on a 1.7 cm pedicle was found, 7 cm from the distal edge. No additional carcinoma was found in the polyp or intestinal wall; however, 2 lymph nodes adjacent to the wall were replaced with metastatic carcinoma. The carcinoma and atypical mucosal glands in the preliminary biopsy specimen, as well as the lymph node tumors, contained tumor associated antigen, while the remainder of the polyp and the surrounding bowel did not. The case refutes the concept that polyps giving rise to adenocarcinoma are polypoid carcinomas from the outset and products of transformation.

2100 FAECAL BILE-ACIDS AND CLOSTRIDIA IN PATIENTS WITH CANCER OF THE LARGE BOWEL. *(E.)* Hill, M. J.; Drasar, B. S.; Williams, R. E. O.; Meade, T. W.; Cox, A. G.; Simpson, J. E. P.; Morson, B. C. (Cent. Public Health Lab., London, England). *Lancet* 1(7906):535-538, 1975.

The fecal bile acid concentrations and presence or absence of nuclear dehydrogenating clostridia were compared in patients with and without large bowel cancer. Sixteen patients with colonic and 12 with rectal cancer were compared to 90 controls (50 with upper alimentary tract disease, 12 with non-malignant large bowel disease, and 28 with non-gastrointestinal disease). Eighty two percent of the cancer patients had fecal bile acid levels of 6 mg/g dry weight feces or over, compared with 17% of the control group. The same percentage of the cancer patients had nuclear dehydrogenating clostridia, compared with 43% of the controls. Seventy percent of the cancer patients had both the clostridia and the high fecal bile acid levels, compared with 9% of the controls. Differences were consistent for the different control subdivisions. Further study in 14 cancer patients and 41 controls showed a significantly higher proportion of mono and unsubstituted bile acids in the cancer patients, possibly indicating more extensive bacterial degradation. These findings support the hypothesis that high concentrations of bile acid derivatives produced by certain anaerobic bacteria play an important etiological role in large bowel cancer.

2101 CLINICAL EXPERIENCES AT ST. MARK'S HOSPITAL WITH MULTIPLE SYNCHRONOUS CANCERS OF THE COLON AND RECTUM. *(E.)* Heald, R. J.; Bussey, H. J. R. (St. Mark's Hosp., London, England). *Dis. Colon Rectum* 18(1):6-10, 1975.

Cases of double synchronous cancers of the large intestine at St. Mark's Hospital from 1928 to 1970 were analyzed. Synchronous growths occurred in 3.5% of cancer resections. The probability that a secondary malignancy would develop subsequent to resection of an initial malignant growth was also 3.5%. Eighty-two percent of the patients in this series had radical removal of both growths, 12% had palliative removal, and 6% were considered inoperable. The 5-yr survival rate after radical resection of double carcinoma was 66%. Following resection of 2 colorectal cancers, 4.3% of patients subsequently developed a third growth (average time 12.5 yr). The risk of developing metachronous growth rose from 3.5% after resection of a single cancer to more than 8% after removal of 2 growths. Cases of triple synchronous carcinoma demonstrated the same average survival time (7 yr 8 months) as that for single cancers. Survival rates based upon stage of malignancy development were: 82.8% after a single Dukes' A tumor; 88% after a double Dukes' A; 62.9% after a single Dukes' B; 66% after a double Dukes' B; 27.8% after a single Dukes' C; 25% after a double Dukes' C. A high incidence (75%) of malignancy was associated with benign tumors; in 27% of the cases, the malignancy was found within a pre-existing benign tumor. Since secondary growths are usually not palpable at operation, the need for detecting them by full clinical and radiologic investigations before any resection of the colon or rectum is emphasized.

2102 MUSCLE SPASM IN SIGMOID DIVERTICULOSIS: EVALUATION OF RETROGRADE COLON OBSTRUCTION BY HYPOTONIC BARIUM ENEMA. *(E.)* Ferrucci, Jr., J. T.; Jaffer, F.; Seidler, R. (Harvard Med. Sch., Boston, Mass.). *J. Can. Assoc. Radiol.* 25(4):269-274, 1974.

Eleven patients with complete retrograde sigmoid obstruction, visualized by routine barium enema, were given the anticholinergic drug propantheline bromide i.m. at 30 mg. Five min after injection a repeat enema was carried out. In 10 of the patients, an obstructing smooth muscle spasm was relaxed, and a preliminary diagnosis of diverticular disease was confirmed in each case. In the eleventh case the drug had no effect, and the resulting diagnosis of possible carcinoma was confirmed on surgery. It is concluded that this technique is useful in diagnosis of uncomplicated diverticular disease, and may avoid unnecessary surgery.

2103 MESENTERIC ARTERIAL INFUSIONS OF VASOPRESSIN FOR HEMORRHAGE FROM COLONIC DIVERTICULOSIS. *(E.)* Athanasoulis, C. A.; Baum, S.; Rosch, J.; Waltman, A. C.; Ring, E. J.; Smith, Jr., J. C.; Sugarbaker, E.; Wood, W. (Massachusetts Gen. Hosp., Boston). *Am. J. Surg.* 129(2):212-216, 1975.

Hemorrhage from colonic diverticulitis was reviewed in 24 cases with respect to recurrence in patients with angiographic therapy only, and in those with additional segmental resection. In each patient after extravasation was located by mesenteric arteriography, 0.2 U/min vasopressin was infused into the supplying artery for 6-12 hr, then 0.1 U/min for 12-24 hr. In 2 patients, the vasopressin was ineffective and surgery was required. One survived and had no recurrance after 10 months. Of the remaining 22, 5 underwent elective colonic resection, 5 had the surgery after recurrence within 6 days, and 12 underwent no surgery. The 5 who had elective surgery had no recurrences after follow-ups of 8-18 months. The 5 who underwent surgery for bleeding had no recurrences after follow-ups of 1-22 months. Of the 12 unoperated patients, 9 had no recurrences after 7-34 months. Two had recurrences at 2 and 4 months and were given surgery. The 3rd was brought under control with conventional drug therapy. It is concluded that mesenteric angiography effectively localizes the bleeding site and directly aids in vasopressin therapy. The resulting hemostasis creates optimal surgical conditions, and the segmental colectomy made feasible by this technique is as effective as subtotal colectomy.

2104 A DOUBLE-BLIND COMPARISON OF THE EFFECTIVENESS OF AZATHIOPRINE AND SULFASALAZINE IN IDIOPATHIC PROCTOCOLITIS: PRELIMINARY REPORT. *(E.)* Caprilli, R.; Carratu, R.; Babbini, M. (2nd Med. Clin., Univ. Rome, Italy). *Am. J. Dig. Dis.* 20(2):115-120, 1975.

The effectiveness of azathioprine was compared with that of salicylazosulfapyridine (sulfasalazine) in 20 patients with the active phase of idiopathic proctocolitis. In the double blind study, patients were paired according to the severity of the disease, and one of each pair was treated with azathioprine (2.5 mg/kg) or salicylazosulfapyridine (65 mg/kg) daily for 3 months. Progress of the disease was checked by endoscopy, radiography, and biopsy. Both drugs caused similar, statistically significant improvement of clinical symptoms, and there was no significant difference in their effects upon endoscopic, histologic, or radiological data. Both endoscopic and histological findings showed significant improvement, but radiological findings were less marked. Hematological analysis showed a significant increase in serum protein after salicylazosulfapyridine treatment. The patients on sulfasalazine showed no side effects, but of those on azathioprine, 3 developed anorexia and 1, leukopenia. These were not serious enough to warrant discontinuation of treatment. It is concluded that azathioprine may be used in colitis when salicylazasulfapyridine is contraindicated, and that radiological findings do not necessarily correlate closely with clinical improvement.

2105 PSEUDOMEMBRANOUS ENTEROCOLITIS. RESURGENCE RELATED TO NEWER ANTIBIOTIC THERAPY. *(E.)* Keeffe, E. B.; Katon, R. M.; Chan, T. T.; Melnyk, C. S.; Benson, Jr., J. A. (Univ. Oregon Med. Sch., Portland). *West. J. Med.* 121(6):462-472, 1974.

Six patients with pseudomembranous enterocolitis were seen at one institution over a 6-month period. Clindamycin therapy preceded the diagnosis in all 6 cases and possibly caused the disease in 5. The patients, 5 men and 1 woman aged 35-75 yr, were admitted for the following reasons and received the antibiotic therapy indicated. A diabetic underwent amputation of the lower left leg due to persistent ulceration. He was given postoperative nafcillin (4 g i.v./day) and gentamycin (180 mg i.m./day) for 10 days, plus 2 doses of clindamycin (total 1,200 mg i.v.) on the second postoperative day. A woman received a 10-day course of ampicillin p.o. for gastroenteritis. Toxic megacolon developed and, beginning the day before subtotal colectomy, she received ampicillin (8 g i.v./day), clindamycin (2,400 mg i.v./day) and gentamycin (240 mg i.m./day). A case with chronic obstructive pulmonary disease and squamous cell carcinoma of the larynx received procaine penicillin (1,200,000 U i.m./day) for 210 days. A laryngectomy with radial neck dissection was performed. Starting the day of operation, he received clindamycin (1,800 mg/day for 7 days, 3 days i.v. and 4 p.o.). A man with peripheral vascular disease had a left-to-right femoral bypass graft. Postoperative antibiotics included cephalosporin (4 g i.v./day for 4 days), aqueous penicillin (6 million U/day i.v. for 8 days), gentamycin (240 mg i.m./day for 3 days), and clindamycin (2,400 mg/day i.v. for 6 days). A man with paraesophageal hiatal hernia and chronic atrial fibrillation secondary to mitral valve and coronary artery disease received clindamycin (total 1,200 mg i.v. in 2 doses), and kanamycin (1,000 mg i.m.) the day before operation and aqueous penicillin (6 million U/day i.v.) for 2 postoperative days. A man with pneumonia received clindamycin (2,400 mg/day i.v. for 6 days). Common clinical features of the pseudomembranous entercolitis which developed in each patient included diarrhea, abdominal pain, fever, leukocytosis, radiographic findings of large bowel dilation with mucosal thickening and characteristic sigmoidoscopic or gross pathologic demonstration of discrete yellow-white plaques on otherwise normal mucosa. Complications included toxic megacolon and sigmoid colon perforation. Of the 6, 2 died. By virtue of these cases and a literature review, lincomycin and clindamycin are implicated in the recent resurgence of this formerly rare variety of colitis.

2106 ANORECTAL ANOMALIES. *(E.)* Nixon, H. H. (Hosp. Sick Child., London, England). *Leban. Med. J.* 27(4):407-411, 1974.

2107 ACTIONS OF BRAN ON COLONIC MOTILITY RELATED TO ITS PHYSICAL PROPERTIES. *(E.)* Kirwan, W. O.; Smith, A. N.; McConnell, A. A.; Mitchell, W. D.; Eastwood, M. A. (Dep. Clin. Surg., Univ. Edinburgh, Scotland). *Gut* 15(10):828, 1974.

2108 OPERATIVE COLOSCOPY: A CURRENT STATUS APPRAISAL. *(E.)* Marks, G. (Med. Coll., Thomas Jefferson Univ., Philadelphia, Pa.). *Dis. Colon Rectum* 17(6):754-758, 1974.

2109 FREE PERFORATION OF THE COLON. ETIOLOGY AND TREATMENT IN 44 CASES. *(E.)* Huttunen, R.; Larmi, T. K. I.; Heikkinen, E.; Rasanen, O. (Oulu Univ. Cent. Hosp., Finland). *Acta Chir. Scand.* 140(7):535-541, 1974.

2110 SPONTANEOUS PERFORATION OF THE COLON. *(Ger.)* Seitz, W.; Forster, C.; Rothmund, M. (Surg. Clin., Univ. Mainz, Germany). *Therapiewoche* 24(18):2043-2048, 1974.

2111 CHOLECYSTOCOLIC FISTULA WITH COLONIC OBSTRUCTION: REPORT OF A CASE. *(E.)* Balsano, N. A.; Reynolds, B. M. (Misericordia Hosp. Med. Cent., Bronx, N.Y.). *Dis. Colon Rectum* 17(6):766-768, 1974.

2112 PSEUDO-OBSTRUCTION OF THE LARGE BOWEL. *(E.)* Bardsley, D. (R. Hosp., Sheffield, England). *Br. J. Surg.* 61(12):963-969, 1974.

2113 ACUTE DILATATION OF THE LARGE INTESTINE IN PATIENTS WITH PROCTOCOLITIS. *(Ger.)* Novak, J.; Nedbal, J.; Maratka, Z.; Hledik, E. (Inst. Postgrad. Med. Pharm., Prague, Czechoslovakia). *Dtsch. Z. Verdau. Stoffwechselkr.* 34(1):45-51, 1974.

2114 TREATMENT OF CHRONIC PROCTITIS WITH DISODIUM CROMOGLYCATE. *(E.)* Heatley, R. V.; Calcraft, B. J.; Rhodes, J.; Owen, E.; Evans, B. (Univ. Hosp. Wales, Cardiff). *Gut* 15(10):829, 1974.

2115 IRRITABLE COLON. *(Ger.)* Nord, H. J. (Dept. Internal Med., Univ. S. Florida, Tampa). *Therapiewoche* 24(22):2565-2569, 1974.

2116 MEGACOLON IN ADULTS: LITERATURE REVIEW. *(Rus.)* Fedorov, V. D.; Gelfenbein, L. S.; Meituv, M. B. (Sci. Res. Lab. Proctol., Moscow, USSR). *Khirurgiia (Mosk.)* (11):136-140, 1973.

2117 IDIOPATHIC COLONIC ULCER: REPORT OF A CASE DIAGNOSED PREOPERATIVELY. *(E.)* Eusebio, E. B.; Kaplan, A. P. (Mt. Sinai Hosp., Minneapolis, Minn.). *Dis. Colon Rectum* 17(6):763-765, 1974.

2118 THE PRESENT STATUS IN HIRSCHSPRUNG'S DISEASE. *(E.)* Nixon, H. H. (Hosp. Sick Child., London, England). *Leban. Med. J.* 27(4):401-405, 1974.

2119 TWO CASES OF COLONIC FAMILIAL MULTIPLE POLYPOSIS IN CHILDREN. *(E.)* Ortiz, J.; Guastavino, E.; Toccalino, H. (Professor A. Posadas Polyclin., Haedo, Argentina). *Acta Gastroenterol. Latinoam.* 6(1):47-50, 1974.

2120 CHRONIC CONSTIPATION AND ULTRA-SHORT SEGMENT HIRSCHPRUNG'S DISEASE IN CHILDREN: DIAGNOSIS AND MANAGEMENT. *(E.)* Shandling, B. (Hosp. Sick Child., Toronto, Canada). *Paediatrician* 3(3/5):213-219, 1974.

2121 ROENTGENOGRAPHIC FINDINGS OF COLO-RECTAL CARCINOMA AND ITS PROGNOSIS. *(E.)* Satoh, K. (Tohoku Univ. Sch. Med., Sendai, Japan). *Asian Med. J.* 17(2):65, 1974.

2122 CANCER OF THE CECUM: A REAPPRAISAL. *(E.)* Adam, Y. G.; Stern, H.; Volk, H. (Albert Einstein Med. Coll., Yeshiva Univ., Bronx, N.Y.). *Isr. J. Med. Sci.* 10(12):1536-1540, 1974.

2123 STATISTICAL AND ETIOLOGICAL ASPECTS OF CARCINOMA OF THE LARGE INTESTINE. A STUDY BASED ON AUTOPSY DATA FROM 1928-1972. *(E.)* Parkash, O. (Wilhelminen Hosp., Vienna, Austria). *Digestion* 11(1/2):115-127, 1974.

2124 MALIGNANCIES OF THE LARGE INTESTINE IN PERSONS LESS THAN 20 YEARS OLD: REPORT OF TWO CASES. *(E.)* Goldman, H. S.; Smith, D. L.; Foote, R. F. (Foote-Smith Proctol. Med. Group Inc., Encino, Calif.). *Dis. Colon Rectum* 17(6):771-776, 1974.

2125 CARCINOMA OF THE COLON ASSOCIATED WITH TUBERCULOSIS: REPORT OF A CASE. *(E.)* Tandon, H. D.; Kapoor, B. M. L. (All-India Inst. Med. Sci., New Delhi). *Dis. Colon Rectum* 17(6):777-781, 1974.

2126 CAVERNOUS HEMANGIOMA OF THE RECTUM AND APPENDIX: REPORT OF A CASE. *(E.)* Harned, R. K.; Dobry, C. A.; Farley, G. E. (Univ. Nebraska Sch. Med., Omaha). *Dis. Colon Rectum* 17(6):759-762, 1974.

2127 GASTROINTESTINAL HEMANGIOMATOSIS. *(Rus.)* Krysko, V. S.; Shavarov, I. G. (Volynsk Reg. Hosp., Lutsk. USSR). *Klin. Khir.* (10):45, 1974.

2128 INTEGRATION OF CHEMOTHERAPY INTO COMBINED MODALITY TREATMENT OF SOLID TUMORS. II. LARGE BOWEL CARCINOMA. *(E.)* Carter, S. K. (Natl. Cancer Inst., Bethesda, Md.) *Cancer Treat. Rev.* 1(2):111-129, 1974.

2129 A COMPARISON OF RESTORATIVE RESECTION OF CARCINOMA OF THE MIDDLE THIRD OF THE RECTUM WITH ABDOMINOPERINEAL EXCISION. *(E.)* Penfold, J. C. B. (Dep. Surg., Univ. Melbourne, Australia). *Aust. NZ J. Surg.* 44(4):354-356, 1974.

2130 DUSTING OF THE MUCOSA IN THE DISTAL LARGE INTESTINE WITH DRY DRUGS. *(Rus.)* Shatyrko, A. S.; Zhukov, A. V. (Truskavets Sanitorium, USSR). *Vrach. Delo* (11):90-92, 1974.

See also, 1885, 1899, 1901, 1902, 1903, 2045, 2046, 2047, 2048, 2055, 2059, 2080, 2133, 2339, 2381, 2397.

LARGE INTESTINE

Ulcerative Colitis

2131 HISTOLOGICAL LIVER DISORDER AND ANTI-COLON ANTIBODIES IN ULCERATIVE COLITIS. *(E.)* Marcussen, H. (Gentofte Hosp., Hellerup, Denmark). *Acta Pathol. Microbiol. Scand.* [*A*] 82(6):714-718, 1974.

The possibility of a correlation between the presence of circulating anti-colon antibodies determined by the indirect immunofluorescent technique and the occurrence of abnormal liver histology in ulcerative colitis was investigated in 97 patients (56 women and 41 men, aged 16-74 yr). Evidence of histological liver changes was present in 39 patients (40%) and included mild degrees of inflammation (14), periportal inflammation (20), chronic pericholangitis (3), cirrhosis (1), focal necrosis (1), and fatty change (7). Anti-colon circulating antibodies were found in 9 patients (19%), in 7 of whom abnormal liver histology was found including mild cell infiltration in 1 case, periportal inflammation in 5 and cirrhosis in 1. Using the described histological parameters of liver disorder, no correlation with the presence of anti-colon antibodies was seen. Varying degrees of cholangitis were noted in 23 cases, but only 5 of these patients (22%) had antibodies in the blood, i.e., the same occurrence in the cholangitis group as in the total patient group. That this study failed to demonstrate a correlation between liver disorder and circulating anti-colon antibodies speaks against the "malsequestrating" theory. It is suggested that factors other than severity of disease influence the ability to develop antibodies.

2132 COAGULATION STUDIES IN ULCERATIVE COLITIS AND CROHN'S DISEASE. *(E.)* Lam, A.; Borda, I. T.; Inwood, M. J.; Thomson, S. (St. Joseph's Hosp., London, Canada). *Gastroenterology* 68(2):245-251, 1975.

The hemostatic mechanisms of 12 patients (5 men and 7 women, aged 21-76 yr) with ulcerative colitis and 12 (4 men and 8 women, aged 17-52 yr) with Crohn's disease were compared to 19 patients with other diseases and to 15 healthy controls. The tests in which no significant differences were found included: hemoglobin, hematocrit, bleeding time, WBC, prothrombin time, partial thromboplastin time, thrombin time, fibrinogen degradation products, protamine sulfate, thrombin generation, and euglobulin lysis time. Test results showing significant differences for ulcerative colitis, Crohn's disease, hospitalized controls and normal controls were: platelets (x 10^3), which were 341, 282, 212, and 194, resp.; factor VIII (%) which were 92.3, 212, 94, and 88, resp.; factor V (%) which were 129, 131, 102, and 94, resp.; fibrinogen (mg/100 ml) which were 427, 433, 317, and 300, resp.; and antithrombin III (U) which were 62.1, 68, 88, and 78.5, resp. These findings suggest that patients with ulcerative colitis, as well as patients with Crohn's disease, may well be predisposed to thromboembolic events because of changes in the hemostatic mechanism. The data indicate that the low antithrombin III level may actually reflect excessive interaction with thrombin, rather than diminution in production of this protein by a damaged liver. The essentially normal bleeding times for the patients indicate that the platelets were functioning normally. It is concluded that the thrombocytosis in these patients was related to bowel disease. It is suggested that individuals with chronic inflammatory diseases of the bowel may produce larger amounts of coagulation factors with a potential increase in thrombin production. Thus, it is suggested that patients with the above mentioned changes be considered as a high risk group and be managed accordingly.

2133 COLONOSCOPY IN INFLAMMATORY BOWEL DISEASE. *(Fr.)* Crespon, B.; Housset, P.; Debray, C. (Bichat Hosp., Paris, France). *Ann. Gastroenterol. Hepatol. (Paris)* 9(6):529-535, 1973.

Colonoscopic examinations were performed on 26 patients with ulcerative colitis; 12 with Crohn's disease of the colon; 4 with poorly defined ulcerative colitis, including 2 with malignant tumors located below the inflammation; 1 with amebic colitis; and 3 with radiation-induced colitis. Ulcerative colitis was characterized by congestion, mucosal fragility, bleeding, and continuous lesions without areas of normal mucosa. In advanced forms the colonic mucosa had been replaced by multiple pseudopolyps, the tops of which coalesced. In Crohn's disease of the colon, the lesions were located in the sigmoid and were segmental in distribution. Aphthoid ulcers were found in some mild cases, while small inflammatory polyps developed around ulcerations in chronic cases. In contrast to pseudopolyps in ulcerative colitis, these pseudopolyps were less numerous, not as highly developed, and did not coalesce at the top. However, to establish a differential diagnosis between ulcerative colitis and Crohn's disease, it is necessary to take into account clinical, radiological, endoscopic, and biopsy findings. Radiation-induced colitis was characterized by a mucosa which was pale, sclerotic, telangectatic, difficult to biopsy, and which bled easily. A case of subacute amebic colitis was characterized only by the nonhemorrhagic nature of the lesions; the diagnosis was established by parasitological examination of the stools and mucus taken during endoscopic examination. In 2 patients with ulcerative colitis located above neoplasms of the left colon, multiple, superficial, nonhemorrhagic ulcerations disappeared several months after removal of the tumors. These lesions might have been caused either by stasis or ischemia. Colonoscopy enabled a diagnosis of Behcet's disease to be made in a patient with ulcerative lesions in the left colon which were not visualized radiologically. Followup colonoscopic examinations showed complete disappearance of ulcerations in 2 patients with ulcerative colitis and, 3 months after corticosteroid therapy, in 2 patients with Crohn's disease of the colon.

2134 EFFECTS OF SULPHASALAZINE (SALAZOPYRIN) ON FAECAL FLORA IN PATIENTS WITH INFLAMMATORY BOWEL DISEASE. *(E.)* West, B.; Lendrum, R.; Hill, M. J.; Walker, G. (St. Mary's Hosp., London, England). *Gut* 15(12):960-965, 1974.

The effects of salicylazosulfapyridine on the fecal flora of 26 patients with inflammatory bowel disease was investigated. Twenty one patients had proctocolitis, of whom 6 had acute exacerbation and 3, complete clinical remission. Prior to the study 11 had been taking salicylazosulfapyridine intermittently for periods of 2 months to 14 yr at 1-3 g daily. Five patients with Crohn's colitis were also studied, one of whom was treated with the drug. No significant differences were found between bacterial counts from 4 patients with Crohn's colitis and 6 with proctocolitis, none of whom had received the drug. Proctocolitis patients with acute exacerbation showed greater numbers of all microbes than those with less active disease, but not to a significant degree. Comparison of the 10 patients who had either condition and had not received the drug with the 5 who had received it throughout showed a significant decrease in the aerobic bacterial count of the latter largely due to reduction of the enterobacteria (7.8 $\log_{10}$ mean bacterial counts/ml feces with no drug; 6.6 with drug). Total anaerobes were reduced from counts of 9.9 to 9.1. In patients who received the drug at some time, but not continually, significant reductions were also found in the enterobacteria (40 fold), in total non-sporing anaerobes (20 fold), and in opalescent-negative clostridia (200 fold). It is concluded that salicylazosulfapyridine causes a consistent decrease in both aerobic and anaerobic bacteria.

2135 SERUM COMPLEMENT COMPONENTS C_3 AND C_4 IN INFLAMMATORY BOWEL DISEASE. *(E.)* Ward, M.; Eastwood, M. A. (West. Gen. Hosp., Edinburgh, Scotland). *Gut* 15(10):835, 1974.

2136 CEA ESTIMATION IN ULCERATIVE COLITIS WITH AND WITHOUT MALIGNANT CHANGE. *(E.)* Dilawari, J. B.; Lennard-Jones, J. E.; Mackay, A. M.; Ritchie, J. K.; Sturzaker, H. G. (St. Mark's Hosp., London, England). *Gut* 15(10):828, 1974.

2137 THE EXTENT OF RECTAL PREMALIGNANT CHANGE IN ULCERATIVE COLITIS. *(E.)* Riddell, R. H. (St. Mark's Hosp., London, England) *Gut* 15(10):822, 1974.

2138 CONSERVATIVE TREATMENT OF ULCERATIVE COLITIS AS SEEN BY PRECISE OBSERVATIONS. *(Pol.)* Kociecka, W.; Goral, R. (Acad. Med., Poznan, Poland). *Przegl. Lek.* 31(3):408-413, 1974.

2139 IMMUNOSUPPRESSIVE CONSEQUENCES OF THE TREATMENT OF ULCERATIVE COLITIS WITH AZATHIOPRINE. *(E.)* Skinner, J. M.; Campbell, A. C.; Waller, C.; Wood, J.; Maclennan, I. C. N. (Radcliff Infirm., Oxford, England). *Gut* 15(10):828-829, 1974.

2140 AMYLOIDOSIS AND GRANULOMATOUS ILEOCOLITIS. REGRESSION AFTER SURGICAL REMOVAL OF THE INVOLVED BOWEL. *(E.)* Fitchen, J. H. (U.S. Air Force Clin., Norton Air Force Base, Calif.). *N. Engl. J. Med.* 292(7):352-353, 1975.

2141 ILEOANOSTOMY IN ULCERATIVE COLITIS (RAVITCH PROCEDURE). *(E.)* Fujiwara, Y.; Ohizumi, T.; Kakizaki, G.; Fujiwara, T. (no affil.). *J. Pediatr. Surg.* 10(1):145-146, 1975.

2142 PSYCHOLOGICAL FACTORS IN A DISEASE SIMILAR TO ULCERATIVE COLITIS IN A KERRY BLUE AND A SKYE TERRIER. *(Ger.)* Adler, R.; Troup, S.; Engel, G. L. (Med. Clin., Univ. Bern, Switzerland). *Z. Gastroenterol.* 12(3):191-192, 1974.

2143 JUSTIFICATION OF DISPENSARY THERAPY FOR CHRONIC INTESTINAL DISEASES. *(Ger.)* Kettner, W. (Bitterfeld Reg. Hosp., Germany). *Z. Aerztl. Fortbild.* 68(6):305-307, 1974.

See also, 2114, 2388, 2395, 2398.

PANCREAS

2144 THE FATE OF HETEROTOPIC PANCREATIC TISSUE. A STUDY OF 212 CASES. *(E.)* Dolan, R. V.; ReMine, W. H.; Dockerty, M. B. (Mayo Clin., Rochester, Minn.). *Arch. Surg.* 109(6):762-765, 1974.

A survey was made of all records of patients in whom the diagnosis of heterotopic pancreas had been made over a 20 yr period in order to determine whether the mass of aberrant pancreatic tissue is, by itself, necessarily a serious matter. A total of 212 patients (136 males and 76 females) were so diagnosed. The largest incidence of discovery occurred in the 6th decade of life. The tissue was found in the stomach (81 cases), duodenum (77), upper part of the jejunum (33), Meckel's diverticulum (11), ileum (3), and 1 each in the common bile duct, umbilicus, gallbladder, hilus of spleen, regional papilla of accessory pancreatic duct, near left gastric artery, and anterior to pancreas. In all but 33 patients, the tissue was found at operation, usually for other conditions. These other 33 patients were diagnosed roentgenographically. A firm causal relation to symptoms was difficult to establish. Obscure gastrointestinal tract bleeding, often attributed to this lesion, was rarely associated with ulceration or necrosis when the lesion was excised and examined microscopically. When heterotopic pancreas was discovered at operation, however, excision was a safe and warranted procedure. It was concluded that heterotopic pancreatic tissue was not responsible for the initial features in the majority of these cases. It is noted that remission of symptoms can be expected as frequently with expectant observation as with surgical intervention. The only obvious exception to this would be patients such as the 3 in this study who had suspected gastrointestinal tract blood loss and who had no such difficulties after operation.

2145 SUPRADIAPHRAGMATIC ASPECTS OF BENIGN PANCREATIC DISEASE. *(E.)* Walton, III, T. P.; Quinilty, R. J. (Louisiana State Univ. Sch. Med., New Orleans). *Am. Surg.* 41(1):32-36, 1975.

A classification of supradiaphragmatic extension of benign pancreatic disease is proposed, based on 74 cases from the literature and 3 new cases (2 men and 1 woman, aged 29-59 yr). The 3 main categories include: pleural accumulation of amylase-rich fluids; direct extension of the pseudocyst; and fistula formation. The category of pleural accumulation of amylase-rich fluids is further subdivided into pancreatothorax, including cases associated with acute pancreatitis, chronic pancreatitis or pseudocyst; pancreatohemothorax; and pancreatochylothorax. The category dealing with the direct extension of the pseudocyst includes mediastinal pseudocyst and cervical pseudocyst. The final category, fistula formation, considers pancreatobronchial fistula and pancreatopleural fistula, the latter being divided into direct and indirect.

2146 EXPERIMENTAL ALLOTRANSPLANTATION OF THE PANCREAS IN DOGS: HISTOPATHOLOGICAL CHANGES. *(Por.)* Ellenbogen, G.; Raia, A. A.; Behmer, O. A.; Pollara, W. M.; Zilberstein, B.; Morimoto, R. Y.; Neto, O. B.; Pinotti, H. W. (Fac. Med., Univ. Sao Paulo, Brazil). *Rev. Hosp. Clin. Fac. Med. Sao Paulo* 29(3):124-132, 1974.

Rejection was studied in 10 male mongrel dogs who underwent total pancreatectomy 5 days before receiving an allotransplant of duodenum and pancreas. The celiac trunk of the explant was anastomosed end-to-end to the proximal segment of the primary iliac artery. Duodenal continuity was reestablished by an end-to-side anastomosis of the distal duodenum of the explant to the lower part of the mid-duodenum in the recipient. Recipients were not given immunosuppressive agents but did receive oxytetracycline (15 mg/kg/day i.m.) postoperatively. Serial biopsies of the transplanted pancreas, taken at 48 hr intervals, revealed intramural fibrin deposits in pancreatic arterioles 4 days after surgery; these were followed by localized fibrinoid arteriolar necrosis on days 6-8. Starting on the 6th day, infiltrates of lymphocytes and plasma cells appeared, mostly around the blood vessels, together with interstitial connective tissue. While no appreciable lesions were observed in the endocrine cells, diffuse necrosis suddenly developed in the exocrine glands at the time of rejection.

2147 AN ACCESSORY PANCREAS IN THE WALL OF THE DUODENUM. *(Rus.)* Chuprina, V. V.; Zaporozhets, V. K. (Voroshilovgrad Med. Inst., USSR). *Khirurgiia (Mosk.)* (3):114-115, 1974.

2148 PANCREATIC DISEASE IN CHILDREN. *(Por.)* Mott, C. de B. (Clin. Hosp., Sao Paulo, Brazil). *Arq. Gastroenterol. Sao Paulo* 11(4):229-235, 1974.

2149 TREATMENT OF CANCER OF THE EXOCRINE PANCREAS. *(Fr.)* Clot, J. P.; Bacourt, F.; Mercadier, M. (Hop. de La Pitie, Paris, France). *Cah. Med.* 15(2):107-110, 1974.

2150 STUDIES ON THE EXTERNAL PANCREATIC SECRETION. *(E.)* Henriksen, F. W. (Inst. Exp. Res. Surg., Univ. Copenhagen, Denmark). *Scand. J. Gastroenterol.* [*Suppl.*] 9:1974.

2151 BIOCHEMICAL STUDIES OF PURE PANCREATIC JUICE OBTAINED BY DUODENOSCOPIC CANNULATION OF THE PANCREATIC DUCT IN CONSCIOUS PATIENTS. *(E.)* Cotton, P. B.; Cremer, M.; Robberecht, P.; Christophe, J. (St. Thomas's Hosp., London, England). *Gut* 15(10): 838, 1974.

See also, 1756, 1886, 1887, 1900, 1904, 1905, 1906, 1909, 2054, 2334, 2339, 2341.

PANCREAS

Pancreatitis

2152 GALLBLADDER AND PANCREAS. *(Ger.)* Neumayr, A.; Peschl, L. (Kaiserin Elisabeth Hosp., Vienna, Austria). *Leber Magen Darm* 3(1):23-28, 1973.

The anatomy and physiology of the pancreas and gallbladder are reviewed and pathoanatomical and pathophysiological aspects of pancreatitis are presented. The draining ducts of the gallbladder and pancreas have anatomically and functionally close relations, with the common bile duct leading to the duodenum in 70-90% of all cases. Under normal conditions, the pressure in the secretion and rest phases is higher in the pancreatic duct than in the choledochus, and consequently the pressure increase occurring in pancreatic duct obstruction makes a pancreatic bile reflux possible. The frequent coincidence of acute pancreatitis with bile duct diseases is due to the activation of proteolytic enzymes and deconjugation of bile salts by bile infected with *E. coli*, clostridia, and enterococci. Trypsin, elastase, and phospholipase A are known to play an important role in the genesis of acute pancreatitis. Vasoactive trypsin impairs the microcirculation in the pancreatic tissue and may lead to serious hemorrhagic pancreatitis. Obstruction of the draining ducts is revealed in about 50% of all cases of chronic pancreatitis. Pancreatitis may result also from cholecystitis conveyed through the lymph system. Secondary stenosis as a result of choledocholithiasis, shrinkage in the region of the sphincter of Oddi, or primary stenosis of unknown etiology, diffuse fibrosis of the pancreas with marked dilatation of the ducts, and susceptibility to episodes of acute pancreatitis are observed in chronic retention pancreatitis. Pain, exocrine pancreas insufficiency, steatorrhea, and loss of weight are the principal symptoms of chronic pancreatitis. Carcinoma of the head of the pancreas or of the papilla of Vater may cause obstruction of the bile duct. Acute cholecystitis is observed in 10% of all patients with acute pancreatitis. Chronic pancreatitis may be complicated by tubular stenosis of the retropancreatic segment of the choledochus, a condition that is very infrequently accompanied by obstructive jaundice.

2153 ELECTROCARDIOGRAPHIC CHANGES IN ACUTE PANCREATITIS. *(It.)* Zacco, R.; Aletti, P.; Martinotti, A.; Sala, G. (Polyclin. Hosp. Milan, Italy). *Atti Acad. Med. Lomb.* 27(1/2/3/4):87-119, 1972.

Electrocardiographic changes were found in 68 of 106 patients (58 men and 48 women) with acute hemorrhagic necrotizing, edematous, or cystic pancreatitis. All patients were in a state of shock; none had gallbladder or heart disease, fevers, or any other diseases which might have interfered with the findings. ECG changes were detected in 18 of 24 men (75%) less than 40 yr old, but in only 16 of 34 men (47%) over 40 yr old. The frequency of ECG changes was about the same in women over 45 yr (21 of 30 or 70%) and in those under 45 yr old (13 of 18 or 72%). The most common types of changes were sinus tachycardia (36 cases), localized ischemia (26 cases), and diffuse ischemia (22 cases). Atrial fibrillation occurred in 2 cases, extrasystole in 3, flutter in 1, and changes suggestive of myocardial infarction in 1 (a 27-yr-old woman). Of the 68 abnormal ECGs, 54 returned to normal within 1-15 days while 6 remained somewhat abnormal although the initial abnormalities did regress; 5 patients were lost to follow-up. From a review of the literature, it is concluded that ECG changes occurring in acute pancreatitis originate in the autonomic nervous system.

2154 THE SERUM COMPLEMENT SYSTEM -- A MEDIATOR OF ACUTE PANCREATITIS. *(E.)* Seelig, R.; Ehemann, V.; Tschahargane, C.; Seelig, H. P. (Inst. Pathol., Univ. Heidelberg, Germany). *Virchows Arch. [Pathol. Anat.]* 365(3):193-199, 1975.

The role of the complement system in the initial membrane lesion of acute pancreatitis was investigated. Acute pancreatitis was induced in 14 male Wistar rats by intraductal injection of 1 ml sodium desoxycholate. Ten minutes after injection a decline of about 20% of serum complement activity was noted. After 60 min the rate of decline reached about 35%; after 180 min, 60%. Analyzing single values allowed the differentiation of 2 groups of rats in this series. In the first group (6 rats), a decrease of serum complement activity to 26% of preoperative values was noted after 180 min. Five of these 6 rats did not survive a short narcosis for blood letting. The only surviving rat showed a 100% decline of complement activity after 360 min. In the second group (8 animals), the rate of decrease did not fall below 50% of the preoperative values. After reaching a minimum level within 3 hr, the serum complement activity rose again to 77% of the preoperative values in 6 hr. Histological examinations revealed that parenchymal damage of pancreatic tissue was related to the rate of decrease of serum complement activity. Progressive leukocytosis and acinar cell necrosis were observed when the rate of decline of complement components was greater than 50% in 3 hr. The deposition of C3 component of complement in acute pancreatitis was demonstrated by immunofluorescence. To rule out mere deposition or activation of complement in the interstitial exudative fluid, single acinar cells of rat and rabbit pancreatic tissue were prepared and transferred to culture medium. In contrast to heat inactivated serum and C6 deficient serum, these cells were lysed by trypsin activated fresh serum. Consequently, an acute pancreatitis could be induced by activating exclusively the complement system by injection of cobra venom factor into the pancreatic duct of rats. The activated complement system may be responsible for initial membrane lesion in exudative inflammation, as could be shown in acute pancreatitis.

2155 PERITONEOCENTESIS AND PERITONEAL PERFUSION IN ACUTE PANCREATITIS: VALUE AND LIMITATIONS. *(Fr.)* Doutre, L. P. (no affil.). *Acta Chir. Belg.* (5):380-386, 1973.

Trypsin and lipase activities were determined in peritoneal fluid from 34 patients with acute abdomen who, at surgery, were found to have either peritonitis, edematous pancreatitis, or hemorrhagic necrotizing pancreatitis. The control group consisted of 16 patients with clinical symptoms of chronic pancreatitis. No significant differences were found in the trypsin activities, but lipase activities were significantly increased only in peritoneal fluid from patients with acute hemorrhagic necrotizing pancreatitis. Preliminary results suggest that if lipase activities in peritoneal fluid exceed 10 Vogel-Zieve U, the patient has pancreatic necrosis. In one patient who developed a fistula after left pancreatectomy for necrosis, both lipase and trypsin activities were still elevated the day before the fistula closed. In another patient, who underwent resection of the duodenum and head of the pancreas, activities of both enzymes decreased to zero over a 5-day period. It is recommended that determination of lipase activities in peritoneal fluid be performed on patients with acute abdomen to determine whether they have pancreatic necrosis and need immediate surgery.

2156 INTERACTIONS BETWEEN PANCREATITIS AND HYPERLIPOPROTEINEMIA. *(Ger.)* Dabels, J. (Med. Clin., Univ. Rostock, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 33(4/5):213-221, 1973.

Attacks of acute pancreatitis and crises of abdominal pain were studied in 127 patients with essential hyperlipoproteinemia. Pancreatitis was found to be a complication of primary essential hyperlipoproteinemia in 8 cases. All patients belonged to types 4 and 5 according to Fredrickson. Disturbances in the fat metabolism in acute and chronic pancreatitis were investigated in 111 patients by the determination of the principal lipid groups and plasma proteins. The incidences of above-normal total lipid, triglyceride, cholesterol, and phospholipid levels were found to be 64%, 42%, 17%, and 11%, resp. The β-lipoprotein and pre-β-lipoprotein levels were 69.4% and 17.9% in acute, and 45.9% and 40.7% in chronic pancreatitis, resp. While the problem of the etiopathogenetic connection between pancreatitis and hyperlipoproteinemia is yet to be solved, the available data indicate that hyperlipoproteinemia may induce, or be a concomitant symptom of, pancreatitis.

2157 ACUTE HEMORRHAGIC PANCREATITIS IN THE DOG. 3. THE EFFECT OF ANTIDIURETIC HORMONE ON PANCREATIC TISSUE AND BODY FLUIDS. *(E.)* Schapiro, H.; Britt, L. G.; Blackwell, C. F.; Gaines, K. (Med. Unit, Univ. Tennessee, Memphis). *Am. Surg.* 41(2): 111-116, 1975.

The effects of antidiuretic hormone, Pitressin (0.25 U/kg/hr, i.v.) on pancreatic tissue and body fluids of 11 dogs subjected to closed duodenal loop obstruction for 24 hr were studied. A closed duodenal loop 10 cm long was created by occluding the duodenum with 0-silk at the pylorus and a point distal to the ventral pancreatic duct. Blood supply to the pancreas and duodenal loop was preserved. Antidiuretic hormone modified the formation of acute hemorrhagic pancreatitis induced by the closed duodenal loop and changed the appearance of the duodenal loop. In untreated dogs, the closed duodenal loop resulted in pancreatic edema and acinar tissue disruption after 12 hr. In dogs treated with antidiuretic hormone, only a slight edema of the pancreas was noted after 24 hr. The closed loop elevated volume and amylase concentration in the peritoneal cavity. However, these increases were considerably less in the antidiuretic hormone treated animals. In untreated animals, the closed-loop fluid was viscous and foul-smelling with a high amylase concentration, and microscopic examination of the duodenal loop tissue revealed blood vessel engorgement, RBC extravasation and villi damage. The treated dogs had a lesser amount of fluid with a slight odor and an amylase concentration considerably less than untreated animals. Microscopically, the antidiuretic hormone-treated duodenal loop revealed blood vessel engorgement with some RBC extravasation, but little or no damage to the villi. In the untreated dogs, the closed loop caused elevated serum amylase after 18 hr and elevated serum lipase after 24 hr. Injections of antidiuretic hormone, i.v., did not modify either the time nor the extent of these enzyme increases, although the extent of pancreatic damage was significantly reduced. Thus, in these experiments, antidiuretic hormone reduced the intensity of the experimentally induced pancreatitis.

2158 CHRONIC PANCREATITIS: ETIOLOGICAL ASPECTS. OBSERVATION OF 50 CASES. *(Por.)* Mott, C. de B.; Ohki, Y.; Barros, M. I. B.; Conte, V. P.; Machado, M. C. C.; Bove, P.; Bettarello, A. (Fac. Med., Univ. Sao Paulo, Brazil). *Rev. Hosp. Clin. Fac. Med. Sao Paulo* 29(6):322-326, 1974.

2159 REGIONAL INCIDENCE OF CHRONIC AND RECURRENT PANCREATITIS. *(Ger.)* Herfort, K.; Bartos, V.; Kotrlik, J. (2nd Res. Inst. Gastroenterol., Charles Univ., Prague, Czechoslovakia). *Dtsch. Z. Verdau. Stoffwechselkr.* 33(6):293-297, 1973.

2160 CURRENT SURGICAL MANAGEMENT OF CHRONIC PANCREATITIS. *(E.)* Gaines, R. D. (Creighton Univ. Sch. Med., Omaha, Nebr.). *J. Natl. Med. Assoc.* 67(1):50-54, 1975.

2161 THE PATHOLOGY OF ENDOCRINE AND EXOCRINE PANCREATIC SECRETION IN PATIENTS WITH CHRONIC PANCREATITIS: INVESTIGATIONS WITH SECRETIN AND PANCREOZYMIN. *(Rus.)* Geller, L. I.; Kazimirchuk, A. P.; Romanets, V. A.; Bulgakova, O. S. (Khabarovsk Med. Inst., USSR). *Klin. Med. (Mosk.)* 52(7):40-45, 1974.

2162 ACUTE PANCREATITIS: PATHOLOGICAL, CLINICAL, AND BIOLOGICAL COMPARISONS. DIAGNOSTIC, PROGNOSTIC, AND THERAPEUTIC DEDUCTIONS (30 CASES). *(Fr.)* Barbas, A. (no affil.). *Cah. Med.* 15(5):237-243, 1974.

2163 ACUTE PANCREATITIS ACCOMPANIED BY SHOCK AND KIDNEY FAILURE. *(Ger.)* Pichler, M.; Kleinberger, G.; Kotzaurek, R.; Pall, H.; Raberger, G.; Szeless, S. (1st Med. Clin., Univ. Vienna, Austria). *Wien. Klin. Wochenschr.* 87(3):83-87, 1975.

2164 THE RESULTS OF SOME LIVER FUNCTION TESTS IN PATIENTS WITH ACUTE PANCREATITIS. *(Rus.)* Suvalskaia, L. A.; Filin, V. I.; Kovalchuk, V. I. (I. I. Dzhanelidze Res. Inst. Emerg. Med. Treat., Leningrad, USSR). *Klin. Med. (Mosk.)* 52(11):67-70, 1974.

2165 CHANGES IN SERUM PROTEINS AND FREE AMINO ACID CONCENTRATIONS IN PERIPHERAL BLOOD VESSELS AND THE PORTAL SYSTEM IN PATIENTS WITH ACUTE PANCREATITIS AND CHOLECYSTOPANCREATITIS. *(Rus.)* Kovalev, M. M.; Tanasienko, I. D.; Lysenko, B. F. (A. A. Bohomolets Med. Inst., Kiev, USSR). *Klin. Khir.* (9):22-29, 1974.

2166 DETERMINATION OF HEME COMPOUNDS IN ACUTE PANCREATITIS. *(Rus.)* Postolov, M. P. (Tashkent Med. Inst., USSR). *Khirurgiia (Mosk.)* (11):81-83, 1973.

See also, 1905, 1906, 1907, 1908, 1909, 2148.

LIVER AND BILIARY TRACT

2167 METASTATIC CARCINOID TO THE LIVER TREATED BY HEPATIC DEARTERIALIZATION. *(E.)* McDermott, Jr., W. V.; Hensle, T. W. (N. Engl. Deaconess Hosp., Boston, Mass.). *Ann. Surg.* 180(3):305-307, 1974.

The effect of hepatic dearterialization on the carcinoid syndrome is described in a 53 yr old female patient, hospitalized for the 4th time with recurrent and progressive carcinoid syndrome. Pre- and postoperative angiography, biochemical parameters, and histopathological findings are presented. This patient had been followed carefully for 4 yr and had been initially treated by hepatic resection, later by chemotherapy and finally by hepatic dearterialization as the tumor regrew and the carcinoid syndrome became incapacitating. Clinical remission was documented by changes in the excretion of 5-hydroxy-indole-acetic acid and by comparison between pre- and postoperative arteriography and by microscopic sections taken at re-exploration for drainage of a necrotic area in the liver. Six months after the dearterialization, the patient had minimal symptoms of occasional flushing and had resumed a normal life. It is pointed out that the technique of ligation is important; proximal ligation of the main hepatic artery should be combined with distal ligation of possible collateral pathways and division of the falciform, coronary and triangular ligaments as well as any obvious branches of the inferior phrenic artery.

2168 PHYSIOPATHOLOGICAL AND CLINICAL SIGNIFICANCE OF HEPATOCYTE STORAGE (S) AND THE TRANSPORT MAXIMUM (Tm) OF BSP IN CIRRHOSIS AND CHRONIC HEPATITIS: CORRELATIONS WITH SINUSOIDAL FLOW. *(It.)* Di Simone, A.; Gentile, S.; Riegler, G.; Coltorti, M. (1st Fac. Med., Univ. Naples, Italy). *Boll. Soc. Ital. Biol. Sper.* 49(23):1411-1414, 1973.

BSP was infused i.v. (0.3 mg/min/kg for 1-3 hr) into 15 patients with cirrhosis, 5 with chronic hepatitis (3 with chronic aggressive and 2 with chronic persistent forms), and 15 normal controls; infusions were continued for 2 more hr at 0.3 and 0.6 times the initial rate, resp. BSP determinations were performed each hour, and S and T_m were calculated by Wheeler's method. Hepatic sinusoidal flow and the plasma clearance constant, K_c, were determined by using the technique of Coltorti *et al.* with a colloidal solution of $^{198}AU\text{-}S_3$. K_c, sinusoidal flow, and T_m were all significantly decreased in cirrhosis. In chronic hepatitis, the values of these parameters were intermediate between those found in cirrhotics and those in controls. Calculation of correlations between the various parameters and partial correlations between T_m and K_c indicates that there is (1) no correlation between the course of T_m and S; (2) a significant correlation between changes in T_m and K_c, which was confirmed by calculation of partial correlations; and (3) no correlation between S and K_c. These findings indicate that changes in BSP clearance in cirrhosis are due primarily to defects in transport and excretion; hepatocyte storage remains essentially unchanged. Apparently hepatocyte storage of BSP is not affected by decreases in T_m and sinusoidal flow.

2169 BILE SALTS AND LIVER DISEASE IN CHILDHOOD. *(E.)* Javitt, N. B. (New York Hosp. - Cornell Univ. Med. Coll., New York, N.Y.) *Postgrad. Med. J.* 50(584):354-361, 1974.

Cholestatic syndromes in the neonate were investigated with respect to newly found bile acid pathways involving conversion of cholesterol directly to monohydroxy bile acids. A 3-month-old child was diagnosed with extrahepatic biliary atresia, and the blood serum bile acid patterns were found to show an extremely high proportion of chenodeoxycholate. Further investigation of these patterns in 25 other cases of infant extrahepatic atresia revealed significantly high proportions of chenodeoxycholate (30-130 g/ml as opposed to normal values of 1-2 g/ml) in all. These patterns correlated much more closely with those of hepatitis than those of other cholestatic syndromes. It is suggested that extrahepatic atresia in infants may be a sequela of neonatal hepatitis rather than a congenital anatomical malformation as previously supposed.

2170 MORPHOLOGICAL INVESTIGATIONS OF PUNCH BIOPSIES OF THE LIVER IN PRECLINICAL WILSON'S DISEASE. *(Ger.)* Mall, G.; Rossner, J. A. (Pathol. Inst., Univ. Heidelberg, Germany). *Verh. Dtsch. Ges. Pathol.* 57:238-243, 1973.

Morphometric examinations were made of liver biopsies from 4 sisters, aged 9-15 yr: 2 had preclinical Wilson's disease and 2 had no evidence of pathological copper deposits in the liver. In preclinical Wilson's disease nonvacuolized lysosomes were decreased and vacuolized lysosomes increased. The increased number of vacuolized "dense bodies" is probably a manifestation of a nonspecific reaction of liver cells to damage. The percentage of the cell volume occupied by the nucleus was somewhat increased. An increase in the number of mitochondria/cell was proportional to the increase in nuclear volume. Mitochondrial volume was increased only in 1 patient who had more marked fatty degeneration and mitochondrial changes. These findings indicate that small mitochondria are found initially in preclinical Wilson's disease, but their volume increases as the disease progresses. It is suggested that the increase in the number of mitochondria and the proportional increase in nuclear volume in more advanced stages of the disease could be regarded as an attempt by the liver to compensate for the damage produced by copper. Large differences in liver cell volume in the 2 normal sisters were caused by differences in the volume of ground substance. This finding was confirmed in 2 follow-up biopsies taken over a 2-yr period and may be caused by recessive Wilson's disease.

2171 THE LIVER IN GM_1 GANGLIOSIDOSIS TYPES 1 AND 2. A LIGHT AND ELECTRON MICROSCOPICAL STUDY. *(E.)* Petrelli, M; Blair, J. D. (Cleveland Metrop. Gen. Hosp., Ohio). *Arch Pathol.* 99(2):111-116, 1975.

The histochemistry and ultrastructure of the liver were studied to attempt to correlate morphological differences between the 2 clinically recognized forms of GM_1 gangliosidosis. Biopsies were obtained from a male infant with the type 1 form of the disease, and a male infant with the type 2 form, characterized by late onset and absence of visceromegaly. Open, live biopsies were performed, and the specimens stained according to Bancroft for light microscopy. For the electron microscopy, specimens were fixed in 4% glutaraldehyde, postfixed in 1% OsO_4 and embedded in epoxy resin. It was found in type 1 that most liver cells contained vacuoles not staining for acid mucopolysaccharides. Most of the Kupffer cells were similarly affected. It was presumed that, since chemical tests had shown a 7-fold increase in liver acid mucopolysaccharides, these substances had been in the vacuoles but had been lost during the histochemical processing. The Kupffer cells were found to contain a granulofibrillar material, identified as a ganglioside by its PAS-positive reaction; however, its ultrastructure was different from that of those found in the brain. In the type 2 specimens, few hepatocytes had vacuoles, but the vacuoles that were found had distinctive folded membranes. The Kupffer cells were affected in clusters, had a strong PAS reaction, and the ultrastructure revealed a fine granulofibrillar material. It is concluded that the scarcity of affected cells in type 2 correlates with the normal liver size and acid mucopolysaccharide and ganglioside values. The distinctive appearance and morphological grouping of the Kupffer cells in this type may prove to be of diagnostic importance.

2172 CLINICAL SPECTRUM OF THE BUDD-CHIARI SYNDROME AND ITS SURGICAL MANAGEMENT. *(E.)* Langer, B.; Stone, R. M.; Colapinto, R. F.; Meindok, H.; Phillips, M. J.; Fisher, M. M. (Univ. Toronto, Fac. Med., Canada). *Am. J. Surg.* 129(2):137-145, 1975.

Five patients with Budd-Chiari syndrome were studied with respect to etiology, clinical course, diagnosis, and therapy. Four out of the 5 women studied were on oral contraceptives. Common presenting features were severe abdominal pain, gross ascites and hepatic enlargement. An important aspect of the clinical course pointed out is the presence of a prodromal period between the first mild symptoms and the full-blown disease, which was observed in 4 out of the 5. The histories included anorexia, epigastric discomfort, abdominal swelling, and nausea. Surgery was undertaken in 2 after irreversible thrombosis of the portal vein had occurred, and the shunts clotted with fatal results. In a third patient, after an unsuccessful spleno-venal shunt, a second operation to create a side-to-side mesocaval shunt was carried out with successful results. One patient treated with anticoagulants still required salt restriction and diuretic therapy for ascites even after 10 months, and the hepatic veins slowly continued to narrow. Therefore an early aggressive surgical approach is recommended for treatment in most cases. Diagnosis was made on none during this period, and 2 died due to late discovery of the disease. Hepatic scintiscan, liver biopsy, and most importantly, hepatic venography are cited as useful diagnostic procedures.

2173 LIVER IN PROGRESSIVE MYOCLONUS EPILEPSY (LAFORA'S DISEASE). *(Ger.)* Huchzermeyer, H.; Gerhard, L. (Pathol. Inst., Univ. Dusseldorf, Germany). *Klin. Wochenschr.* 52(12):559-567, 1974.

Histological, histochemical, and clinical studies on progressive myoclonic epilepsy (Lafora's disease) are reviewed, and original observations are presented. A moderate proliferation of the collagenic connective tissue, along with infiltration of lymphocytes, plasmocytes, and leukocytes with polymorphous nuclei between the connective tissue fibers were found in Glisson's fields in Lafora's disease type I after 3 yr. Histochemical investigations revealed intracytoplasmic deposits in hepatocytes primarily of the lobular periphery, diffuse interlobular periseptal fibrosis with reactive interlobular inflammatory infiltration, as well as granular and filamentous components of the hepatocyte deposits. The findings are in good agreement with previous studies.

2174 DEMONSTRATION OF FLUORESCENT, AFLATOXIN B_1-TYPE SUBSTANCES IN THE HUMAN LIVER. *(Fr.)* Richir, C.; Morard, J. L.; Larcebau, S.; Pujol, J. (Fac. Med., Univ. Bordeaux II, Gradignan, France). *Arch. Fr. Mal. App. Dig.* 63(5):391-394, 1974.

Quantitative determinations of aflatoxins were performed on liver tissue, obtained at autopsy, from 50 French patients, aged 24-88 yr (mean age 63 yr), with cirrhosis (11 cases), cardiac liver (10), fatty liver (9), hepatic metastases (4), primary liver cancer (1), hemochromatosis (2), and miscellaneous diseases (8); 5 subjects had normal livers. Residue from a chloroform extract of homogenized liver tissue was first fractionated by chromatography on an alumina column and then identified by thin-layer chromatography on silica gel. Aflatoxin B_1-like material was detected in the livers of 2 patients with alcoholic cirrhosis and portal hypertension and 1 with acute hemorrhagic necrotizing pancreatitis. The aflatoxin contents were 3 μg/kg and 1.6 μg/kg in the 2 cases in which they were large enough to be measured; the liver of the remaining patient contained only traces. These values are much lower than others previously reported in the literature; this might be due to incomplete extraction or to the possibility that some aflatoxin disintegrates after death. The two patients with cirrhosis both drank large quantities of wine, but studies of various commercially available red and white wines failed to disclose the presence of aflatoxin. It is suggested that aflatoxin might be involved in the development of liver cancer in cirrhotics which has been observed in France.

2175 INTRACELLULAR LOCATION OF α-FETOPROTEIN IN LIVER DISEASE. *(Fr.)* Uriel, J. (Inst. Sci. Res. Cancer, Villejuif, France). *Bull. Cancer (Paris)* 60(4):363-370, 1973.

By using ^{3}H-estrone or ^{3}H-estradiol, α-fetoprotein (α-FP) was studied autoradiographically in (1) rat liver cells during histogenesis, (2) hepatocellular carcinoma in man and the rat, and (3) nonneoplastic liver disease. In liver from fetal and newborn rats, α-FP was present in hepatocytes but not in hematopoietic or Kupffer cells or cells of the bile canaliculi. Labeled cells, which never exceeded 1-2% of the entire population, were found in isolation or in small groups, primarily near blood vessels. Within 4-5 days after birth, α-FP also appeared in cells near the portal spaces in areas where bile canaliculi were proliferating. These labeled cells were morphologically intermediate between small hepatocytes and cells covering the bile canaliculi. The cytoplasm or, less frequently, the nucleus and cell membranes of similar cells contained α-FP in primary liver tumors in adult rats and man. In both species these cells were most often found in (1) isolation among the tumor trabeculae, frequently at the edge of capillary sinusoids; (2) grouped near portal spaces in areas where canaliculi were undergoing neoplastic proliferation; and (3) as inclusions in areas of stromal reaction, along with fusiform and proliferating canalicular cells. As in fetal rat liver, a relatively small number of cells secreting α-FP were sufficient to cause high serum titers, as determined by immunodiffusion. In a liver biopsy from a patient with viral hepatitis, α-FP was present in cells similar to labeled cells observed in rats older than 4-5 days and in primary liver tumors. This cell type was also found in the livers of rats which had ingested a diet containing aflatoxin for 2 months. This labeling was observed for 2 months after discontinuation of the carcinogen when no signs of neoplastic transformation were visible. In both cases, labeled cells were near foci of regeneration. Although the exact nature of cells secreting α-FP could not be established, they appear to be immature transitional cells which could either differentiate into hepatocytes or cholangiocytes and which appear to contribute, under some conditions, to hepatic regeneration.

2176 ANALYSIS OF BROMSULPHTHALEIN DISAPPEARANCE CURVES, RELATIVE STORAGE CAPACITY, TRANSPORT MAXIMUM, AND 45-MINUTE DYE RETENTION. *(Ger.)* Spech, H. J.; Wernze, H. (Med. Clin. Univ. Wurzburg, Germany). *Klin. Wochenschr.* 52(10):499-504, 1974.

Relationships between bromosulphthalein elimination, relative storage capacity, transport maximum, and 45-min dye retention were studied in 24 male and female patients with hepatic dysfunctions (cirrhosis, diabetic and alcoholic fatty liver, and liver metastasis in 11, 12, and 1 cases, resp.), and compared with 12 normal controls. Elimination curves obtained following injection of bromosulphthalein (5 mg/kg, i.v.) were compared with relative storage capacity and transport maximum determined by the infusion technique started 60 min after the single injection of the dye. The initial elimination constant k_1 was significantly reduced in patients with both cirrhosis and fatty liver, compared to normal subjects. A considerable percentage of these patients showed values within the lower range of standard variation of normals. The overall elimination constant k_2 was significantly reduced only in the cirrhotic patients. All patients and control subjects showed a significant correlation between k_2 and bromosulphthalein transport maximum at a correlation factor of 0.856, but not between elimination constant k_1 and the relative storage capacity. The 45-min dye retention, used as an isolated value of the elimination curve, showed a significant correlation with both the elimination constant k_2 and the transport maximum with respective correlation factors of 0.646 and 0.720, but not with the elimination constant k_1. The elimination constant k_2 and the 45-min dye retention over 1.0 mg% are suggested to be quantitative parameters of hepatobiliary bromosulphthalein excretion compared to the more complex measurement of the transport maximum. The relationship between the 45-min dye retention and the transport maximum, though statistically significant, is subject to great variations in individual cases. The findings indicate the absence of uniform, disease-specific bromosulphthalein elimination curves in fatty liver and liver cirrhosis.

2177 A MORPHOMETRIC STUDY OF THE ENDOPLASMIC RETICULUM IN HUMAN HEPATOCYTES. CORRELATION BETWEEN MORPHOLOGICAL AND BIOCHEMICAL DATA IN SUBJECTS UNDER TREATMENT WITH CERTAIN DRUGS. *(E.)* Jezequel, A. M.; Koch, M.; Orlandi, F. (Univ. Ancona Sch. Med., Italy). *Gut* 15(9):737-747, 1974.

A morphometric study was conducted on the endoplasmic reticulum of hepatocytes obtained by needle biopsy from 4 normal, untreated patients and from 4 patients with no liver disease who received diazepam (20-60 mg for 2-4 days), from 1 patient with Gilbert's syndrome who was given phenobarbital (360 mg) for 4 days, and from 1 normal patient who received dilantin (50 mg) for 7 days. In normal, untreated subjects, the amount of smooth endoplasmic reticulum exceeded that of rough endoplasmic reticulum and accounted for 76.3% of the total hepatocyte endoplasmic reticulum. Two components of the smooth endoplasmic reticulum were identified: a vesicular component with a regular honeycomb pattern made up of cisternae with patent lumina and a mean width of 1500 Å (type 1) and a non-vesicular component which occurs in discrete foci of densely packed smooth membranes with a spacing of 140 Å (type 2). Type 1 and type 2 smooth endoplasmic reticulum comprised 2.23 and 0.68 μ^2/μ^3 of cytoplasm, resp., compared to the total smooth endoplasmic reticulum surface density of 2.91 μ^2/μ^3 in normal subjects. Short-term diazepam treatment caused no change in the rough endoplasmic reticulum (0.89 μ^2/μ^3) but did significantly increase the smooth endoplasmic reticulum with a 2- to 3-fold increase of type 2 smooth endoplasmic reticulum in 3 of the 4 patients. ^{14}C-acetate incorporation into digitonin-precipitable sterols (cholesterol) as measured in biopsy materials was increased by about 2.5-15-fold in the same 3 patients compared to normal controls. No changes in endoplasmic reticulum or in cholesterol synthesis were observed in the dilantin-treated patient or in the phenobarbital-treated patients. The increase in the type 2 smooth endoplasmic reticulum membranes follows the administration of substances known to induce microsomal enzymes, and it is suggested that the type 2 represents newly formed while the type 1 represents mature membranes.

2178 PRIMARY CARCINOMA OF THE JUVENILE LIVER: HYPERGAMMAGLOBULINEMIA, α_1-FETOPROTEIN, AND POSITIVE AUSTRALIA ANTIGEN. *(Sp.)* Rodriguez Cuartero, A.; Nunez Carril, J.; Urbano Jimenez, F. (San Cecilio Clin. Hosp., Granada, Spain). *Rev. Esp. Enferm. Apar. Dig.* 44(5):509-520, 1974.

2179 ALPHA-FETOPROTEIN IN PRIMARY LIVER CANCER AND OTHER DISEASES. *(E.)* Kew, M. (Johannesburg Gen. Hosp., South Africa). *Gut* 15(10): 814-821, 1974.

2180 RESECTION OF THE LEFT LOBE OF THE LIVER FOR PRIMARY LIVER CANCER. *(Rus.)* Valter, V. G.; Zurnadzhiants, V. A. (Astrakhan Med. Inst., USSR). *Khirurgiia (Mosk.)* (3):113-114, 1974.

2181 HEPATIC METASTASES: CLINICAL FEATURES, ENDOSCOPY, AND BIOLOGY. *(Ger.)* Hofstetter, J. R.; Realini, S. (Med. Polyclin., Univ. Lausanne, Switzerland). *Z. Gastroenterol.* 12(1): 49, 1974.

2182 HEPATECTOMY FOR LOCALIZED LESIONS. *(Rus.)* Alperovich, B. I. (Tomsk Med. Inst., USSR). *Vestn. Khir.* 113(11):31-34, 1974.

2183 LIVER DISEASE AND PREGNANCY. *(Rus.)* Benediktov, I. I.; Balezin, L. Z. (Sverdlovsk Med. Inst., USSR). *Akush. Ginekol. (Mosk.)* (3): 54-55, 1974.

2184 THE INFLUENCE OF CHRONIC LIVER DISEASE ON THE ELIMINATION OF D-PROPRANOLOL, ANTIPYRINE, AND INDOCYANINE GREEN. *(E.)* Branch, R. A.; James, J. A.; Read, A. E. (R. Infirm., Bristol, England). *Gut* 15(10):837-838, 1974.

2185 STUDIES OF VITAMIN B_{12} ABSORPTION IN CHRONIC LIVER DISEASE. *(Ger.)* Konrad, H.; Kiencke, H.; Teichmann, W.; Bielka, B. (Med. Clin., Univ. Rostock, Germany). *Radiol. Diagn. (Berl.)* 14(6):759, 1973.

2186 CELL-MEDIATED IMMUNITY TO HUMAN TAMM-HORSFALL GLYCOPROTEIN IN AUTOIMMUNE LIVER DISEASE ASSOCIATED WITH RENAL TUBULAR ACIDOSIS. *(E.)* Tsantoulas, D. C.; McFarlane, I. F.; Portmann, B.; Eddleston, A. L. W. F.; Williams, R. (King's Coll. Hosp., London, England). *Gut* 15(10):826, 1974.

2187 THE CLINICAL COURSE OF REYE'S SYNDROME. *(Ger.)* Mutz, I.; Grubbauer, H. M.; Weikmann, E.; Muller, W. (Pediatr. Clin., Univ. Graz, Austria). *Wien. Klin. Wochenschr.* 86(24):745-749, 1974.

2188 ABSCESSES OF THE LIVER. *(Fr.)* Pellet, B.; Ryncki, P. V.; Mir, A.; Mir, M. (Canton. Hosp., Lausanne, Switzerland). *Helv. Chir. Acta* 41(5/6):683-690, 1974.

2189 SURGICAL TREATMENT OF HYDATID CYSTS OF THE LIVER: CONCERNING A SERIES OF 381 CASES. *(Fr.)* Mentouri, B.; Daoud, K.; Haroud, M.; Hammani, A. (Surg. Clin., Univ. Algiers, Algeria). *Helv. Chir. Acta* 41(5/6):675-681, 1974.

2190 LYSOSOMAL CHANGES IN HUMAN AND EXPERIMENTAL IRON OVERLOAD. *(E.)* Seymour, C. A.; Budillon, G.; Peters, T. J. (R. Postgrad. Med. Sch., London, England). *Gut* 15(10):838, 1974.

2191 LIVER FUNCTION IN PATIENTS WITH MUSCULO-SKELETAL TRAUMA. *(Rus.)* Eselev, M. M.; Usvitskii, A. E. (Saratov Med. Inst., USSR). *Ortop. Travmatol. Protez.* (7):69-71, 1974.

2192 GASTROINTESTINAL BLEEDING CAUSED BY RUPTURE OF AN ANEURYSM OF THE HEPATIC ARTERY OR ONE OF ITS BRANCHES: ONE CASE REPORT. *(Fr.)* Desligneres, S.; Rouer, K.; Abelanet, R.; Bricaire, H. (Cochin Hosp., Paris, France). *Cah. Med.* 14(10): 883-887, 1973.

2193 HEPATOSPLENIC SYNDROME IN YEMEN. *(Rus.)* Skripnichenko, V. A. (Kiev Med. Inst., USSR). *Vrach. Delo* (12):127-129, 1974.

2194 FULMINANT HEPATIC FAILURE: HISTOLOGICAL QUANTITATION OF SURVIVING LIVER PARENCHYMA IN THE EVALUATION OF THE CAUSE OF DEATH. *(E.)* Portmann, B.; Gazzard, B. G.; Murray-Lyon, I. M.; Williams, R. (King's Coll. Hosp., London, England). *Gut* 15(10):830, 1974.

2195 HEPATIC RESECTION: LITERATURE REVIEW. *(Rus.)* Milonov, O. B.; Starikova, V. B.; Fenomenov, A. M. (All-Union Sci. Res. Inst. Exp. Clin. Surg., Moscow, USSR). *Khirurgiia (Mosk.)* (11):141-146, 1973.

2196 SURGICAL ANATOMY OF THE LIVER: VARIATIONS AND DEVELOPMENT OF TECHNIQUES FOR HEPATECTOMY AND SHUNTS. *(Fr.)* Ryncki, P. V. (Dep. Surg., Univ. Lausanne, Switzerland). *Helv. Chir. Acta* 41(5/6):543-574, 1974.

See also, 1611, 1756, 1813, 1850, 1877, 1888, 1900, 1910, 1911, 1912, 1913, 1914, 1915, 1916, 1917, 1918, 1923, 2131, 2156, 2199, 2222, 2247, 2253, 2257, 2260, 2277, 2290, 2294, 2309.

LIVER AND BILIARY TRACT

Hyperbilirubinemic States

2197 SIGNIFICANCE OF ALBUMIN-BILIRUBIN BINDING IN DRUG THERAPY IN THE NEWBORN. *(Ger.)* Windorfer, Jr., A.; Karitzky, D. (Pediatr. Clin., Univ. Freiburg/Breisgau, Germany). *Monatsschr. Kinderheilk.* 123(1):27-30, 1975.

Sephadex gel filtration was used to study the effect of a variety of drugs on the albumin-bilirubin complex (molar ratio 1:1). When used at maximum concentrations found in the serum of premature and newborn infants (50 and 100 µg/ml), ampicillin, carbenicillin, cephalothin, colistin, erythromycin, gentamicin, penicillin, and phenobarbital displaced little bound bilirubin (0.3-1.3%). When added in concentrations far above those found in premature and newborn sera, digoxin, furosemide, isoproterenol, and triflupromazine displaced 1.5-2.6% of the bound bilirubin. Drugs which have been shown to displace bound bilirubin in premature and newborn infants were added in concentrations found in the serum of these infants. Diazepam, novobiocin, oxacillin, and trimethoprim (all at 50 and 100 µg/ml) and sulfamethoxazole (100 and 200 µg/ml) displaced 2.7% bilirubin or less; a combination of sulfamethoxazole and trimethoprim (50 and 100 µg/ml) displaced 2.5% and 3.5%, resp.; and sodium salicylate (200 and 300 µg/ml) displaced 7.9% and 10.5%, resp. Exchange transfusions of fresh heparinized blood decreased free fatty acid levels and increased albumin-bilirubin binding in 12 cases; increased free fatty acid levels and decreased bilirubin binding in 5; and decreased both free fatty acids and bilirubin binding in 2. Drugs suspected of interfering with bilirubin binding should not be given to newborns with hyperbilirubinemia unless absolutely necessary, and then they should be administered simultaneously with human albumin.

2198 THE EFFECT OF INDOCYANINE GREEN ON ALBUMIN-BILIRUBIN BINDING IN THE NEONATAL PERIOD. *(Ger.)* Kretzschmar, G. W. (Pediatr. Clin., Univ. Stockholm, Sweden). *Monatsschr. Kinderheilk.* 123(1): 31-33, 1975.

Fractionated Sephadex gel filtration was used to compare the effect of indocyanine green on albumin-bilirubin binding with that of sulfafurazole, a drug which is known to cause kernicterus in newborns who have even mild hyperbilirubinemia. Indocyanine green displaced more bilirubin from the albumin-bilirubin complex than did sulfafurazole. However, because of the small doses of indocyanine green employed for dye dilution curves (0.1 mg/kg) and its short half-life, indocyanine green in unlikely to produce kernicterus. The only risk would be in premature infants given exchange transfusions. These transfusions increase the concentrations of free fatty acids which also interfere with bilirubin binding, and the overall effect of these factors might result in kernicterus. In contrast, sulfafurazole is excreted so slowly that plasma concentrations of 150 mg/100 ml can be reached; this is equimolar to a bilirubin concentration of 320 mg/100 ml.

2199 EFFECTS OF CALORIC AND NONCALORIC MATERIALS IN FASTING HYPERBILIRUBINEMIA.

(E.) Barrett, P. V. D. (Harbor Gen. Hosp., Torrance, Calif.). *Gastroenterology* 68(2):361-369, 1975.

The roles of p.o. and i.v. administered nutrients, and of physical factors were investigated in the reversal of fasting hyperbilirubinemia. Subjects were normal (4), or were patients with chronic aggressive hepatitis (2), Gilbert's syndrome (2), hereditary spherocytosis (2), primary biliary cirrhosis (2), or alcoholism (1), and were fasted for 15 to 39 hr prior to the study. Water, saline, mannitol, glucose, amino acids and medium chain triglycerides were given p.o in equicaloric amounts of 400 cal (mannitol and saline were at a concentration of 1220 mOsm). Mannitol, glucose, and amino acids were also given i.v. at resp. concentrations of 100 g/liter, 100 g/liter, 50 g/liter, resp., and saline at 301 mEq/liter, An *in vitro* study was also performed in which normal saline, glucose (100, 200 or 400 mg/100 ml) or mannitol (400 mg/100 ml) was incubated with whole blood from an icteric patient to rule out possible influences of the diazo reaction on serum bilirubin determination. It was found that p.o. administration of water caused an increase in the serum bilirubin, while saline, mannitol, amino acids, and triglycerides did not alter it. In contrast, glucose caused a significant decrease of 8% within 3 hr. I.v. glucose, mannitol, and amino acids caused a significant increase similar to that of the p.o. water (21-61% over control values). I.v. or p.o. loading with hypertonic saline, osmotically equivalent with the i.v. glucose and mannitol concentrations, failed to produce an increase in total serum bilirubin, ruling out osmotic factors. It is concluded that glucose is the factor responsible for reversal of fasting hyperbilirubinemia after eating.

2200 DUBIN-JOHNSON SYNDROME AND RELATED SYNDROMES: THEIR CLASSIFICATION.

(It.) Coppo, M. (Inst. Med. Clin., Univ. Modena, Italy). *Fegato* 19(2):469-479, 1973.

Rotor's syndrome and Burka's syndrome are generally considered related to Dubin-Johnson syndrome. In Rotor's syndrome the patients are jaundiced but the liver is not pigmented, while in Burka's syndrome the liver is pigmented but the patient is anicteric. According to his experience, the author considers this classification arbitrary and unacceptable. In Dubin-Johnson syndrome the characteristic pigmentation often develops after the onset of jaundice, and the chronology of functional defects in hepatocyte excretion differs from one case to another. Dubin-Johnson syndrome cannot be ruled out if the liver is a mottled green, rather than black, at laparoscopy. It may be that Rotor's syndrome is actually a mild, initial, or regressive form of Dubin-Johnson syndrome. Intercurrent acute hepatitis sometimes results in chronic hyperbilirubinemia followed by complete loss of hepatic pigmentation, so it may appear that Dubin-Johnson syndrome has been transformed into Rotor's syndrome. In contrast, Dubin-Johnson syndrome and Burka's syndrome are believed to be distinct clinical entities. It has been demonstrated that results of the BSP clearance test and the ultrastructure of hepatic pigmentation are quite different in these 2 syndromes. Dubin-Johnson syndrome is defined as a dissociated form of intrahepatic cholestasis in which conjugated bilirubin appears in the blood under basal conditions and after i.v. injection of free bilirubin; conjugated BSP appears in the blood after i.v. injection of free BSP; and indocyanine green clearance is normal. Patients have no pruritus, bile acid retention, hypercholesteremia, or increased serum alkaline phosphatase levels.

2201 HISTOPATHOLOGICAL, HISTOCHEMICAL, AND ULTRASTRUCTURAL STUDIES OF THE LIVER IN SOME PATIENTS WITH DUBIN-JOHNSON AND ROTOR'S SYNDROMES.

(It.) Sciacca, A.; Soccorsi, P.; di Giacomo, V.; Carmenini, G.; Fragola, P. (Inst. 1st Med. Clin., Univ. Rome, Italy). *Fegato* 19(2):499-531, 1973.

From an extensive review of the literature and their own findings, the authors conclude that there is no unequivocal evidence to demonstrate that transport disorders in Dubin-Johnson and Rotor's syndrome are the result of ultrastructural lesions in the liver. The authors have rarely found mitochondrial changes, and abnormalities in the endoplasmic reticulum and vascular pole of the hepatocytes were later identified as artifacts. The significance of dilatations in intercellular space is unknown, but this change has been observed in a variety of diseases accompanied by liver cell damage. No relation could be established between the rare finding of "curly" structures and the disorder in bilirubin excretion. Studies of liver pigmentation in Dubin-Johnson syndrome suggest that the large deposits of pigment consist of a mixture of lipofuscin and melanin, while the smaller deposits present in some patients with Rotor's syndrome consist primarily of lipofuscin.

2202 INTRAHEPATIC STORAGE CURVE FOR ^{3}H-BILIRUBIN IN GILBERT'S DISEASE BEFORE AND AFTER PHENOBARBITAL THERAPY.

(It.) Tiribelli, C.; Cobelli, C.; Frezza, M.; de Sandre, G. (Inst. Spec. Med. Pathol., Univ. Trieste, Italy). *Fegato* 19(2):423, 428, 1973.

Curves for intrahepatic storage of ^{3}H-bilirubin were obtained from curves for plasma clearance of ^{3}H-bilirubin plotted for 3 normal subjects and 6 patients with Gilbert's disease before and after phenobarbital therapy (150 mg/day for 7 days). Before treatment, patients with Gilbert's disease had significant increases in 2 of the 4 transfer constants calculated. These were the storage time (ta), the time needed to pass from 90% to 90% of the maximum value in the 2 slopes of the curve, and the decrease time (td), the time needed to decrease from the maximum value to 50% of the maximum. The relative height of the intrahepatic storage curve, dpm to/tp, was also significantly increased in patients with Gilbert's disease. After phenobarbital treatment, the transport constants remained essentially unchanged, while the relative height of the intrahepatic ^{3}H-bilirubin storage curve decreased to normal values. The increases in transfer constants in Gilbert's disease are attributed to a decrease in bilirubin storage in the liver and to disorders in excretion which may be due to failure of bilirubin to conjugate with glucuronic acid.

2203 STEREOMETRIC STUDY OF THE OCCURRENCE OF GIANT LIVER MITOCHONDRIA IN PATIENTS WITH GILBERT'S DISEASE AS COMPARED TO NORMAL CONTROLS. *(Fr.)* Slabodsky-Brousse, N.; Feldmann, G.; Brousse, J.; Dreyfus, P. (Beaujon Hosp., Clichy, France). *Biol. Gastroenterol. (Paris)* 7:179-186, 1974.

Ultrastructural stereometric techniques were used to determine the relative volume, relative surface area, and ratio of surface area to volume of liver mitochondria in 9 patients with Gilbert's disease (7 men and 2 women, aged 18-45 yr) and 10 controls (6 men and 4 women, aged 20-60 yr) with no clinical, biological, or histological evidence of liver disease. None of the patients or controls was a chronic alcoholic or had received estrogens. No difference between these 2 groups was found for the mean relative volume occupied by mitochondria (17.93% in Gilbert's disease, 17.03% in controls) or for the mean relative surface area (0.96 $\mu^2:\mu^3$ hepatocyte in Gilbert's disease, 1.03 $\mu^2:\mu^3$ hepatocyte in controls). The mean ratio of surface area:volume of the mitochondria was 5.34 $\mu^2:\mu^3$ in Gilbert's disease and 6.13 $\mu^2:\mu^3$ in controls. Mitochondria were then grouped into 39 classes, according to mitochondrial diameters: group I included classes 1 and 2 (0.5-1 μ); group II included classes 3, 4, and 5 (1.5-2.5 μ); and group III included classes 6 through 39 (equal to or greater than 3 μ). Group I mitochondria were significantly more common among controls, while group III mitochondria were significantly more common in patients with Gilbert's disease. The controls had no mitochondria with diameters larger than 4.5 μ. These findings suggest that giant mitochondria are an ultrastructural characteristic of Gilbert's disease. The significance of these giant mitochondria is unknown.

2204 PROLONGED SURVIVAL IN THE CRIGLER-NAJJAR SYNDROME: ULTRASTRUCTURAL AND DIETARY STUDIES. *(E.)* Gollan, J. L.; Huang, S. N.; Billing, B. H.; Sherlock, S. (R. Free Hosp., London, England). *Gut* 15(10):838, 1974.

2205 BILIRUBINOPATHY AND HEREDITARY HEPATOCYTIC ENZYME DEFICIENCY. *(It.)* Giordano, A.; Coggi, G.; Grigolato, P. (Inst. Anat., Univ. Milan, Italy). *Fegato* 19(2):321-331, 1973.

See also, 1773, 1775.

LIVER AND BILIARY TRACT

Nonviral Hepatitis and Hepatic Injury

2206 DRUG METABOLISM IN NORMAL CHILDREN, LEAD-POISONED CHILDREN, AND NORMAL ADULTS. *(E.)* Alvares, A. P.; Kapelner, S.; Sassa, S.; Kappas, A. (Rockefeller Univ., New York, N.Y.). *Clin. Pharmacol. Ther.* 17(2):179-183, 1975.

The metabolism rates of phenylbutazone and antipyrine in children and adults were determined in a study on age dependence of hepatic drug-metabolizing enzymes in man. Ten normal adults (25-40-yr-old) and 10 children (1-8-yr-old) were studied. Of the children, 2 were normal and 8 had biochemical evidence of lead poisoning. Phenylbutazone was administered (6 mg/kg, p.o.), then blood was drawn on days 1-5, and 7 for determination of plasma phenylbutazone levels. Antipyrine dissolved in syrup was administered (18 mg/kg, p.o.) and blood drawn 3, 6, 9, 12, and 15 hr following administration for determination of plasma antipyrine levels. The mean phenylbutazone half-lives in the children and adults (1.68 and 3.16 days, resp.) differed significantly. The mean antipyrine half-life in the whole group of 10 children, 6.63 hr, was significantly lower than the mean half-life of 13.58 hr obtained in adults. There were no differences between the 2 normal children and the 8 lead-poisoned children in their capacities to metabolize the 2 drugs. It appeared that children in the age range studied metabolize drugs at almost twice the rate of adults, which differs from findings in animals in which drug-metabolizing capacities increase with maturation. The results, therefore, indicate that the age dependence of hepatic drug-metabolizing enzymes found in experimental animals may not apply to man, and the increased metabolism of the 2 test drugs observed in children has considerable significance in the calculation of proper dosages of drugs.

2207 SEVERE HEPATITIS FROM METHYLDOPA. *(E.)* Maddrey, W. C.; Boitnott, J. K. (Johns Hopkins Med. Inst., Baltimore, Md.). *Gastroenterology* 68(2):351-360, 1975.

Hepatitis secondary to methyldopa therapy was studied to emphasize the importance of checking for a possible drug etiology in all patients with a histological picture suggesting chronic aggressive hepatitis. Clinical, pathological, and serological studies were made on 6 patients with severe hepatitis following methyldopa therapy. All 6 patients (women, 38-62-yr-old) continued to take methyldopa after the onset of symptoms, and all had laboratory evidence of hepatitis with elevations of serum transaminases. The drug was inadvertently readministered to 1 patient with recurrence of hepatitis within 1 week; all rapidly improved after discontinuation of the drug. The authors emphasize the need to consider the diagnosis of hepatitis and to determine serum transaminases whenever a patient on methyldopa develops symptoms of fatigue, anorexia, nausea and vomiting; and, also, to discontinue the drug in those patients with abnormal liver function tests and constitutional symptoms suggestive of hepatitis.

2208 QUINIDINE-INDUCED GRANULOMATOUS HEPATITIS. *(E.)* Chajek, T.; Lehrer, B.; Geltner, D.; Levij, I. S. (Hadassah Univ. Hosp., Jerusalem, Israel). *Ann. Intern. Med.* 81(6):774-776, 1974.

A case of quinidine-induced granulomatous hepatitis is reported in a 69-yr-old male. The patient was readmitted with fever of 1 day duration 2 days after having been discharged from another hospital where he had been treated for congestive heart failure with digoxin, furosemide and quinidine. This represented the 1st time he had been treated with quinidine. On physical examination, the patient exhibited bilateral axillary adenopathy and a liver palpable 2 cm below the costal margin. Erythrocyte sedimentation rate was 30 mm/hr (Westergren); WBC, 5200/mm; serum bilirubin, 1 mg%; alkaline phosphatase, 205 mU (normal, 25-85); and SGOT, 430 U (norlam, 10-50). These improved following quinidine withdrawal, but symptoms, physical findings and abnormal liver function tests again returned upon challenge with quinidine. Liver biopsy 5 days after challenge showed numerous granulomas without caseation or giant cells. The patient's indices again returned to normal 1 day after quinidine was discontinued. A 2nd quinidine challenge 2 months later produced the same results as the 1st challenge. This represents the 1st reported case of histologically confirmed quinidine-induced granulomatous hepatitis.

2209 PENICILLIN AND EPLUCHAGE TREATMENT OF HEPATIC ACTINOMYCOSIS. *(E.)* Prioleau, P. G.; Brochu, F. L. (VA Hosp., Salem, Va.). *Arch. Surg.* 109(3):426-429, 1974.

A rare case of primary hepatic actinomycosis is reported in which prolonged penicillin therapy and removal of the involved tissue were successfully employed. A 44-yr-old white male hospital dietary storeroom worker was admitted with a 2-month history of persistent right upper quadrant abdominal pain. This began after he had suffered a traumatic fraction of the right 7th rib, which healed normally. He was a severe alcoholic and had previously undergone surgery for chronic pancreatitis; he had also had an appendectomy and a cholecystectomy. Exploratory laparotomy revealed actinomycosis of the anterior right lobe of the liver. Prolonged penicillin therapy and removal of the involved hepatic tissue in multiple-staged operative procedures were successful in eliminating the disease. The patient died 27 months after diagnosis following prolonged alcoholic ingestion. He had no evidence of active actinomycosis when last examined 10 weeks prior to death. Death from abdominal actinomycosis may be secondary to direct extension of the disease to the lung, kidney, or liver; the cause of death in the present case is unknown.

2210 HEPATITIS CAUSED BY ACQUIRED TOXOPLASMOSIS: TWO CASE REPORTS. *(Fr.)* Beauvais, P.; Koenig, H.; Alexandrovicius, H.; Dorr, R.; Somolo, P. (Mulhouse Hosp. Cent., France). *Pediatrie* 29 (6):615-625, 1974.

2211 AN ELECTRON MICROSCOPIC STUDY OF LIVER IN HEPATOMEGALY PRESUMABLY CAUSED BY AMEBIASIS. *(E.)* Tandon, B. N.; Tandon, H. D.; Puri, B. K. (All-India Inst. Med. Sci., New Delhi). *Exp. Mol. Pathol.* 22(1):118-132, 1975.

LIVER AND BILIARY TRACT

Acute Viral Hepatitis

2212 CONCENTRATION OF HEPATITIS-B ANTIGEN FROM CLINICAL PREPARATIONS OF II, VII, IX, AND X BY POLYETHYLENE GLYCOL, TO ENHANCE DETECTION AND REMOVAL. *(E.)* Johnson, A. J. (New York Univ. Med. Cent., N.Y.). *Ann. N.Y. Acad. Sci.* 240:162-164, 1975.

Hepatitis B antigen (HB Ag) was concentrated from clinical preparations of factor II, VII, IX, and X concentrates by selective precipitation with polyethylene glycol (PEG). Of 27 batches of concentrate intended for clinical use, measurable amounts of HB Ag were found in 70% using the PEG method. In order to assess the efficacy of this procedure, small amounts of antigen-positive serum were added to the concentrates and removed by the PEG method. As shown by radioimmunoassay results, virtually all antigen was removed in the 1st precipitation. After a 2nd fractionation, the remaining antigen was less than 1 standard deviation from the mean of the negative control. This method increased the sensitivity for detecting HB Ag and the assayable antigen was removed before clinical use.

2213 INTRANUCLEAR VIRUS-LIKE PARTICLES IN HEPATOCYTES OF AN ASYMPTOMATIC HEPATITIS B ANTIGEN CARRIER WITH DANE PARTICLES IN THE SERUM. *(E.)* Yamada, G.; Kosaka, K. (Okayama Univ. Med.

Sch., Okayama, Japan). *Gastroenterology* 68(2):370-373, 1975.

A case history is reported for an asymptomatic hepatitis B antigen (HB Ag) carrier (male, 33 yr old) with Dane particles in the serum and many intranuclear virus-like particles within the hepatocytes. Physical examination, blood picture, and liver function tests were normal, except for the indocyanine green excretion test, with a clearance of 0.16. Dane particles with small particles (20 nm) and tubular forms were observed in the serum by electron microscopy. With light microscopy, the liver showed slightly swollen hepatocytes, periportal fibrosis, and eosinophilic granular inclusions in the nuclei of some hepatocytes. Under electron microscopy, many spherical particles measuring 10-25 nm in diameter were found randomly distributed and in clusters in the nuclei of hepatocytes. Many of these particles had a denser peripheral wall, a few were uniformly dense, and the contour of some were hexagonal. Some virus-like particles were seen near the pores of nuclear membranes. It has been suggested that these intranuclear particles and the inner bodies of Dane particles are the same, but there is also the possibility that they are entirely different. These intranuclear virus-like particles may be continuously replicated and appear as Dane particles in the serum of asymptomatic HB Ag carriers.

2214 PATTERN OF CORE AND SURFACE EXPRESSION IN LIVER TISSUE REFLECTS STATE OF SPECIFIC IMMUNE RESPONSE IN HEPATITIS B. *(E.)* Gudat, F.; Bianchi, L.; Sonnabend, W.; Thiel, G.; Aenishaenslin, W.; Stalder, G. A. (Dep. Pathol., Univ. Basel, Switzerland). *Lab. Invest.* 32(1):1-9, 1975.

A series of 67 liver biopsies (20 kidney transplant recipients, immunosuppressed; and 47 outpatients with hepatitis, no immunosuppression) was studied for the presence of hepatitis B antigen core (HB$_c$) and surface (HB$_s$) components by immunofluorescence and electron microscopy. HB$_c$ was demonstrated mainly in the hepatocyte nuclei, and HB$_s$ exclusively within the cytoplasm. Based on these findings and histological and clinical parameters, 4 reaction types were identified. Type I (Elimination Type) showed only occasional or no expression of HB$_c$, was a classic lobular hepatitis, histologically, and clinically an acute, self-limiting viral hepatitis. Type II (HB$_c$ Predominance, or Immunosuppression Type) had HB$_c$ in every hepatocyte nucleus and focal expression of HB$_s$, showed nonaggressive inflammation (nonspecific reactive or portal hepatitis) histologically, and clinically was a mild, chronic and persistent hepatitis in transplant patients. Type III (HB$_s$ Predominance, or Nonaggressive Type) had prominent HB$_s$ expression with little HB$_c$; histologically there was nonaggressive inflammation or normal liver tissue, together with ground-glass hepatocytes (as seen with light microscopy correlating with the HB$_s$-containing hepatocytes), and clinically there was chronic persistent hepatitis and the patient was a HB antigen carrier. Type IV (HB$_{c+s}$ Equivalence, or Aggressive Type) showed occasional expression of both components, especially the core; had periportal hepatitis, histologically; and clinically was a chronic aggressive hepatitis or an acute hepatitis with possible transition to chronicity. It was suggested that immune responsiveness determines the reaction pattern, with immune elimination of affected cells being the key mechanism. The demonstration of HB Ag in hepatocytes of seropositive patients might be a sign of persistent HB virus infection and an indication of an impaired immune elimination of infected cells. These 4 types of reactions are of prognostic value.

2215 DETECTION OF AUSTRALIA ANTIGEN IN URINE AND SALIVA. *(E.)* Tanno, H.; Fay, O. H.; Roncoroni, M.; Garcia, C.; Katz, R. (Parque Sanit., Rosario, Argentina). *Acta Hepatogastroenterol. (Stuttg.)* 21(5):373-376, 1974.

The presence of the Australia antigen (HB$_s$Ag) was studied in the urine and saliva of 13 seropositive patients (6 with acute hepatitis, 4 with chronic hepatitis, and 3 with postnecrotic cirrhosis). HB$_s$AG was detected in the urine and saliva using counter-electrophoresis. The antigen was found both in the urine and the saliva of 85% (11 of 13) of those tested (in 5 of 6 cases of acute hepatitis, in 3 of 4 cases of chronic hepatitis, and in 3 of 3 cases of postnecrotic cirrhosis). There was no difference found in the types of proteins filtered in the urine between the HB$_s$Ag-positive and the HB$_s$Ag-negative specimens. The presence of the antigen in these body fluids may be important as a means of transmission.

2216 HEPATITIS B ANTIGEN IN SALIVA, URINE, AND STOOL. *(E.)* Irwin, G. R.; Allen, A. M.; Bancroft, W. H.; Karwacki, J. J.; Brown, H. L.; Pinkerton, R. H.; Willhight, M.; Top, Jr., F. H. (Walter Reed Army Inst. Res., Washington, D.C.). *Infect. Immun.* 11(1):142-145, 1974.

A survey of hepatitis B patients, asymptomatic hepatitis B surface antigen (HB$_s$Ag) carriers and control subjects was conducted to determine the relation between antigenemia and antigen excretion in saliva, urine and stool. From 5-10 ml of saliva and 100 ml of first-morning urine were collected twice weekly. A stool specimen was obtained once a week. Blood was drawn from all subjects. Radioimmunoassay was used to detect HB$_s$Ag in concentrated urine and stool specimens, and unconcentrated saliva and serum samples. Radioimmunoassay-positive sera was tested for specificity by an inhibition test using antibody to surface antigen. Specificity-confirmed HB$_s$Ag was detected in the saliva of 6 of 20 antigenemic patients (30%), in 1 of 20 nonantigenemic patients (5%), in 14 of 41 carriers (34%), and in none of the 112 controls. HB$_s$Ag was detected in urine only after 100-fold concentration. Specificity-confirmed HB$_s$Ag was present in the urine of 7 of 43 carriers (16%) unconfirmed HB$_s$Ag was found in the urine of 5 of 38 patients (13%), and in 5 controls (5%). Unconfirmed HB$_s$Ag was detected in stool specimens from 5 of 11 patients (46%), and in none of the 8 carriers and controls. The findings suggest that when HB$_s$Ag is present in the serum, it may also be in the saliva, urine, and stool. Whether the presence of HB$_s$Ag in these substances will correlate with their infectivity remains to be determined. Until infectivity tests are possible, however, saliva, urine, and stool from antigenemic persons should be considered infectious.

2217 CLINICAL AND EPIDEMIOLOGICAL SIGNIFICANCE OF THE HB_SAg (AUSTRALIA ANTIGEN): CARRIER STATE.

(E.) Feinman, S. V.; Cooter, N.; Sinclair, J. C.; Wrobel, D. M.; Berris, B. (Mt. Sinai Hosp., Univ. Toronto, Canada). *Gastroenterology* 68(1): 113-120, 1975.

The clinical and epidemiological significance of the Australia antigen (HB_SAg) was studied up to 30 months in 115 asymptomatic carriers of the antigen in Toronto, Canada. Only 1 carrier had any previous history of icteric disease. There was a male to female ratio of 3.6:1 and the majority of carriers were less than 30 yr old. A high prevalence of carriers was found in persons from Mediterranean countries and the Orient. A moderate elevation of IgG was found in 6 of 77 carriers. No general defect in cell-mediated immunity was found, and the different subtypes of HB_SAg correlated with ethnic origin. Normal liver function tests were found in 53% of the carriers; SGPT was elevated in 30%; thymol turbidity was abnormal in 22%; and BSP retention test was abnormal in 14 of 51 carriers (27%). Features of chronic benign persistent hepatitis were present in 20 of 29 liver biopsies, but there was no transition to aggressive hepatitis during the 30 months of observation. SGPT was the most common abnormal value and this correlated best with biopsy findings. It was shown that age, sex, and ethnic origin were important host factors that influenced the development of the carrier state. All carriers remained well during the follow-up period.

2218 RELATION OF PROTRACTION OF ACUTE VIRAL HEPATITIS TO AUSTRALIA ANTIGEN.

(E.) Kamada, T.; Akeyama, T.; Noyama, T.; Abe, H. (Osaka Univ. Med. Sch., Japan). *Acta Hepatogastroenterol. (Stuttg.)* 21(5):358-363, 1974.

The role of Australia antigen HB_SAg (as determined by counterimmunoelectrophoresis and single radial immunodiffusion) in the protraction of acute viral hepatitis was studied. The study included 127 acute viral hepatitis patients (86 with no history of transfusion, and 41 with posttransfusion hepatitis; 69 males and 58 females). Diagnosis was made by physical and laboratory findings (including serum bilirubin and transaminases). A protracted case was defined as one where the abnormal laboratory findings extended beyond 180 days. Acute hepatitis was protracted in 29 (22.8%) of the 127 patients. HB_SAg or antibody was detected in 47 (37%) of the 127 and the disease was protracted in 12 (25.6%) of the 47. It was protracted in 17 (21.3%) of 80 antigen-negative patients: thus there was no difference in protraction rate between antigen-positive and negative patients (contrary to some previous studies). The rate of protraction was higher in patients older than 30, and in males that were HB_SAg-positive. In the nontransfusion group the rate of protraction was lower in antigen-negative patients (5.2%) and 25.5% in the positive patients. The disease was protracted in all 7 patients who remained HB_SAg-positive for more than 6 months. This may indicate that HB_SAg plays an important role in the protraction of hepatitis.

2219 SERIAL STUDIES OF HEPATITIS-ASSOCIATED ANTIGEN AND ANTIBODY IN PATIENTS RECEIVING ANTITUMOR CHEMOTHERAPY FOR MYELOPROLIFERATIVE AND LYMPHOPROLIFERATIVE DISORDERS.

(E.) Wands, J. R.; Chura, C. M.; Roll, F. J.; Maddrey, W. C. (Johns Hopkins Univ. Sch. Med., Baltimore, Md.). *Gastroenterology* 68(1):105-112, 1975.

A population of 85 patients (25 with myeloproliferative disorders and 60 with lymphoproliferative disorders) was serially studied to determine the effects of antitumor chemotherapeutic agents (especially cyclophosphamide, 50 mg/kg/day; and cytosine arabinoside, 50 mg/kg/day) on hepatitis B antigen (HB Ag) and hepatitis B antibody (HB Ab). During the study HB Ag, as determined by hemagglutination inhibition and hemagglutination, was detected in 17 patients and HB Ab in 40 (a titer of 1:4 or greater considered positive). In 17 chemotherapy patients there was a decrease in preexisting HB Ab titers which corresponded to the period of maximal bone marrow suppression. In 14 of the 17, the values returned to pretreatment values after treatment. Five patients with preexisting HB Ab developed HB Ag and a rise in serum transaminase enzymes, suggesting hepatocellular damage during chemotherapy. In 3 of these a reappearance of HB Ab was associated with the disappearance of HB Ag. HB Ag persisted longer than 3 months in the other 2 patients. In 3 patients with pretreatment HB Ag, this titer increased with chemotherapy, parallel with the maximum period of bone marrow suppression. Hepatocellular damage also occurred. In 2 of these patients, the HB Ag titers returned to pretreatment levels. Chemotherapeutic agents caused a decrease in preexisting HB Ab titers and an increase in preexisting HB Ag. Whether this appearance or increase of HB Ag was related to an inhibition of antibody formation, allowing expression of preexisting antigen, or to an inhibition of cellular immunity, allowing viral proliferation, is uncertain.

2220 SERUM LIPOPROTEINS IN ACUTE VIRAL HEPATITIS

(Ger.) Baumgarten, M.; Wienbeck, M.; Englhardt, A.; Martini, G. A. (Med. Clin., Univ. Marburg, Germany). *Klin. Wochenschr.* 52(13):617-623, 1974.

Lipoproteins of 20 patients with acute viral hepatitis were studied in native serum and in serum after precipitative ultracentrifugation by means of lipid electrophoresis and immunological methods. In addition, high-density lipid (HDL) fractions were analyze by disc electrophoresis. The observations covered 1 to 8 weeks. The onset of the disease was counted from the appearance of jaundice. The α-lipoproteins were markedly reduced and continued to decrease further during the first 3 weeks of the disease, while the β-lipoproteins were significantly elevated and continued to rise during the first 3 weeks. The pre-β-lipoproteins were moderately but regularly reduced

uring the whole course of the disease. The lipopro-
ein levels began to normalize 6 weeks after the on-
et of the disease. Incomplete separation of β- and
re-β-lipoproteins, of α-lipoproteins, and of the
ipoproteins within the albumin fraction on the ace-
ate foils was observed in certain patients. How-
ver, ultracentrifugal separation indicated that
hese lipoproteins belong to the well-known fractions,
hus indicating an altered speed of migration in the
lectrical field. In conclusion, all 3 types of α-
ipoproteins were detected in the α-lipoproteins of
he HDL fraction and typical quantitative and quali-
ative changes in the serum lipoproteins in the course
f acute viral hepatitis.

221 PLASMA α-LIPOPROTEIN PATTERN IN ACUTE VIRAL HEPATITIS. *(E.)* Thalassinos, N.; Hatzio-
nnou, J.; Scliros, P.; Kanaghinis, T.; Anastasiou,
.; Crocos, P.; Thomopoulos, D.; Gardikas, C. (Evan-
elismos Hosp., Athens, Greece). *Am. J. Dig. Dis.*
0(2):148-155, 1975.

detailed study was done to illustrate the serial
hanges in plasma lipoprotein, triglyceride, and
holesterol levels during the course of acute viral
epatitis. A group of 57 patients (mean age 30.8
r) with the disease were followed both clinically
nd biochemically. Blood samples were taken at 10-
ay intervals to determine serum bilirubin, SGOT,
GPT, plasma lipoprotein, cholesterol and trigly-
erides. The tests were continued until serum bili-
ubin was less than 2.5 mg/100 ml. Mean levels of
lasma triglyceride were elevated at the onset of
he disease and gradually returned to normal; mean
lasma cholesterol values gradually increased. α-
ipoprotein was absent at the early stage of hepatitis
n 41 of 46 patients and reappeared gradually during
he course of the disease. In 11 cases of viral
epatitis with impending or overt coma, α-lipoprotein
as absent for the duration of the acute stage and
ever reappeared in those who eventually died, while
t eventually returned to normal in those who sur-
ived. This study demonstrates that plasma α-lipo-
rotein is dramatically reduced during the acute
hase of acute viral hepatitis and reappears in or-
inary cases within 20-30 days from onset of jaun-
ice; its reappearance appears to be a sensitive
ndex of improvement and a significant prognostic
ign.

22 RELATIONSHIP OF SERUM α-FETOPROTEIN TO THE SEVERITY AND DURATION OF ILLNESS IN PATIENTS
ITH VIRAL HEPATITIS. *(E.)* Bloomer, J. R.; Waldmann,
. A.; McIntire, K. R.; Klatskin, G. (Yale Univ. Sch.
ed., New Haven, Conn.). *Gastroenterology* 68(2):342-
50, 1975.

evels of serum α-fetoprotein in 176 patients with
iral hepatitis were studied in relation to the se-
erity and duration of illness. A radioimmunoassay
ocedure with a lower limit of sensitivity of 5 ng/
l, was used, and values greater than 40 ng/ml were
nsidered to be increased, as compared to controls.
ncreased levels of α-fetoprotein were found in 38%
the 176 patients. Of 75 patients with subacute
epatic necrosis (characterized by zones of necrosis that bridged adjacent portal triads and/or central veins and showed more extensive hepatocellular necrosis than classical hepatitis), 52% had increased α-fetoprotein and 9 of these exceeded 500 ng/ml. Only 28% of the 101 patients with classic hepatitis lesions had elevated values, and none of these exceeded 500 ng/ml. A higher percentage of patients under age 30 had increased levels. There was no linear relationship between serum α-fetoprotein and levels of SGOT, serum bilirubin, serum alkaline phosphatase, prothrombin time, and serum proteins. In subacute hepatic necrosis, the highest increase of α-fetoprotein occurred when the symptoms had been present for about 4 weeks, and when levels of SGOT were decreasing. This indicated that the α-fetoprotein peaked when the necrotic phase of the lesion was subsiding. This rise was related to a longer survival time and associated with prominent features of regeneration. The monitoring of the fetoprotein may be an indicator of hepatic regeneration.

2223 A SECOND ANTIGEN-ANTIBODY SYSTEM IN VIRAL HEPATITIS. *(Fr.)* Lemaire, A. (no affil.). *Nouv. Presse Med.* 3(27):1715-1716, 1974.

Research done by Hoofnagle *et al.* on core (nucleocapsid) antigen (CAg) and antibody (CAb) in 350 subjects (patients recovering from hepatitis, blood donors, and hemophiliacs) is reviewed. Pure nucleocapsids were isolated from Dane particles by ultracentrifugation of liver homogenate obtained from a chimpanzee which died after infection with human serum containing Australia antigen (HB$_s$Ag), subtype *ayw*. Radioimmunoassay showed the absence of any protein from the viral mantle, i.e. HB$_s$Ag. Injection of CAg into guinea pigs induced production of antobodies which fixed complement in the presence of CAg, but not in the presence of HB$_s$Ag or liver extract. Studies in humans demonstrated that CAg is specific for hepatitis B: it was never detected in sera from patients with hepatitis A. CAb could be detected 10-20 weeks after contact with an infected subject, i.e. 3 weeks after development of jaundice, and 4-10 weeks after serological detection of HB$_s$Ag. CAb always appeared before Australia antigenies (HB$_s$Ab) when virus was present in the blood and when liver function tests were most abnormal, whether or not the patient had jaundice. CAb occurred more frequently than HB$_s$Ab and was sometimes present in low titers for 3 yr.. Although HB$_s$Ab was detected in only 9 chronic carriers of hepatitis, CAb was present in all 50 carriers studied. CAb was found more often in commercial than in volunteer blood donors, but it was less common in both of these groups than HB$_s$Ab, suggesting that it is less persistent than HB$_s$Ab. CAb was less common and was present in lower titers among hemophiliacs than among commercial donors. Since CAb is associated with the persistence of HB$_s$Ag in the circulation, these antibodies may form in response to active replication of the virus. There is as yet no satisfactory explanation for the presence of HB$_s$Ag, HB$_s$-Ab, and CAb alone or simultaneously in the same serum. These investigations suggest that blood containing high titers of CAg should not be used for transfusion, even if HB$_s$Ag cannot be detected.

2224 POTENCY OF FRAGMENTED IgG: TWO STUDIES OF POSTEXPOSURE PROPHYLAXIS IN TYPE A HEPATITIS.

(E.) Brachott, D.; Lifschitz, I.; Mosley, J. W.; Kendrick, M. A.; Sgouris, J. T. (Minist. Health, Ramalah, Israel). *J. Lab. Clin. Med.* 85(2): 281-286, 1975.

Studies were performed to determine the effect of fragmentation on potency of immunoglobulin preparations. Immunoglobulin preparations (1 from U.S., 1 from Israel) were compared, in both fragmented and unfragmented forms, with each other and with a placebo. In each of the 2 studies, 3 materials were given to household contacts (2-9 yr of age) of icteric hepatitis: human albumin as a placebo; immunoglobulin with the IgG intact; and immunoglobulin of the same lot with the IgG deliberately fragmented by added fibrinolysin. The dose of globulin administered averaged 0.026 ml (4.3 mg of IgG protein)/kg body weight; the children were observed over a 60-day period. In the 1st study of 1767 children, the number of cases of secondary attack were: 28 of 593 following placebo; 16 of 573 following administration of unfragmented globulin; and 13 of 601 following administration of fragmented globulin. In the 2nd study of 1419 children, the number of cases of secondary attack were: 35 of 463 following placebo; 16 of 479 following unfragmented globulin; and 14 of 477 following fragmented globulin. The results showed that comparable reductions in secondary attack rates were achieved with fragmented and unfragmented materials from both lots of globulin. The authors conclude that fragmentation by fibrinolysin does not lower potency for postexposure prophylaxis of hepatitis A.

2225 NEW CONTRIBUTION TO THE PROBLEM OF CONNATAL VIRAL HEPATITIS.

(E.) Farkas, E.; Hajdi, G.; Moro, A.; Hollos, I.; Palfi, A.; Wohlmuth, G. (Laszlo Munic. Hosp. Infect. Dis., Budapest, Hungary). *Infection* 2(4):196-200, 1974.

Infants with viral hepatitis were studied to determine the probability of diaplacental transmission of viral hepatitis on the basis of antigenemia. The 16 infants studied were 2-5 months old, 7 of whom were found to be positive for the Australia antigen (HB_s-Ag). A common feature of the cases was antigenemia of the mother and child. Routine tests were made to determine serum bilirubin level, SGOT and SGPT enzyme activity, also to determine HB_sAg, the related antibody and the circulating antigen-antibody complex. Diaplacental infection was evident in a case of hepatitis in a newborn baby delivered of an HB_sAg-positive mother having serum hepatitis during gestation or at delivery, or becoming HB_sAg-positive during her illness. It is concluded that maternal antigenemia is a potential hazard, and suggested that the definition of connatal viral hepatitis be revised on the basis of the identification of HB_sAg.

2226 HEPATITIS B IN AN ONCOLOGY UNIT.

(E.) Wands, J. R.; Walker, J. A.; Davis, T. T.; Waterbury, L. A.; Owens, A. H.; Carpenter, C. C. J. (Johns Hopkins Univ. Sch. Med., Baltimore, Md.). *N. Engl. J. Med.* 291(26):1371-1375, 1974.

An epidemic of hepatitis B among the 91 personnel in an oncology ward is described. Acute icteric hepatitis (as shown by marked elevation of the glutamic oxalacetic transaminase and bilirubin values) developed in 9 of the 91 workers, and asymptomatic anicteric hepatitis in 1. In 19 additional personnel, there was evidence for asymptomatic exposure to hepatitis B surface antigen (HB_sAg) by a 4-fold or greater rise in pre-existing hepatitis B surface antibody (anti-HB_s) titer (as determined by hemagglutination inhibition and hemagglutination), and by seroconversion from anti-HB_s negative to positive A 19.5% frequency of HB_sAg was detected in 87 tumor patients before, during, and after the epidemic. In 5 asymptomatic patients with pre-existing HB_sAg, unusually high titers (mean value of 1:128,000) developed on high doses of antitumor chemotherapy. On of these patients may have been a common source of exposure for 8 of the personnel. Because asymptomatic and anicteric HB_sAg-positive tumor patients represent a great risk to oncology-unit personnel, prophylactic measures and precautions should be instituted in these wards.

2227 SEVERE VIRAL HEPATITIS TYPE B IN INFANCY.

(E.) Dupuy, J. M.; Frommel, D.; Alagille, D. (INSERM, Child. Hosp., Bicetre, France). *Lancet* I(7900):191-194, 1975.

Case histories are presented for 14 infants, aged 2-5 months, with severe acute viral hepatitis. The hepatitis B surface antigen (HB_sAg) and/or hepatitis B antibody (HB Ab), as determined by counter-immunoelectrophoresis, microcomplement fixation, inhibitio of passive hemagglutination, or radioimmunoassay were present in 11 cases. Eight infants had received blood derivatives in the neonatal period, and HB_sAg-positive hepatitis developed in 7 of these, suggesting a causal relationship between the hepatitis and the carrier state of the mother. In all patients, the prothrombin time was 10% or less of normal and the levels of SGPT and bilirubin were increased. Liver biopsies showed widespread necrosis without inflammatory cells. Despite intensive supportive therapy, exchange transfusions, and administration of anti-HB_sAg γ-globulins, the mortality rate was high (57%). Liver regeneration was shown by an increase in clotting factor V and the appearance of α-fetoprotein in the serum. Differences in incubation time found in some cases suggested an oral route of infection in those with the longer incubation period, rather than a parenteral route. The study showed that infants can completely eliminate the hepatitis B virus after showing all the signs of hepatitis type B. The outcome of the disease seemed to be influenced by the route of infection, dose of the virus, presence of maternal antibodies, and possibly genetic susceptibility.

2228 OBSERVATIONS ON ACUTE PHASE AND FOLLOW-UP OF SIMILAR SERIES OF CASES OF HB-Ag POSITIVE AND HB-Ag NEGATIVE HEPATITIS.

(E.) Chiaramonte M.; Dardanoni, L.; Farini, R.; Filippazzo, G.; Genova G.; Naccarato, R.; Pagliaro, L.; Spano, C. (Dep. Med. Univ. Palermo, Italy). *Rend. Gastroenterol.* 6(1):1-5 1974.

A comparison between 177 patients with HB Ag-positive (HB Ag+) acute hepatitis and 169 patients with HB Ag-negative (HB Ag-) acute hepatitis was carried out. The cases were followed until complete recovery, or death, or until a pathologically defined type of chronic liver disease developed. A preliminary analysis showed a similar distribution of the patients of the HB Ag$^+$ and HB Ag- groups for age and sex and for initial values of SGOT, SGPT, and bilirubin. Diagnosis of chronic aggressive hepatitis or cirrhosis fulfilled the generally accepted criteria and was ultimately confirmed or excluded by histological examination. The sera of all patients with a chronic sequelae were examined by direct immunofluorescence for anti-nucleus, anti-smooth muscle, and anti-mitochondria antibodies, and by the latex test for anti-IgG antibodies (rheumatoid factor). HB Ag in sera was detected by immunodiffusion, high voltage counter electrophoresis and quantitative complement fixation. Both the acute initial attack and the chronic sequelae of hepatitis appeared more severe in the HB Ag+ cases. In the group of 177 HG Ag+ patients, 5 died during the acute jaundice phase and 4 developed cirrhosis, whereas none in the group of 169 HB Ag- patients died or became cirrhotic. The 12 patients with HB Ag+ acute hepatitis who developed chronic aggressive hepatitis were predominantly males (10 of 12) and 7 of 12 received steroids during the acute jaundice phase. Results of this study support earlier conclusions that, after an acute attack of HB Ag+ hepatitis, the persistence of HB Ag in blood seems associated with continuing liver disease, without any instance of chronic post-jaundice healthy carrier state. It is suggested that the healthy carrier state may be connected with an impairment of the mechanism causing clearance of HB Ag from the blood stream. All patients who developed chronic sequelae following an acute attack of HB Ag+ hepatitis remained chronically HB Ag+, suggesting that in these patients the persistence of HB Ag in the organism plays a determinant role. These data also confirm the usefulness of the HB Ag assay as a prognostic tool.

2229 VIRAL HEPATITIS AND ITS MULTIPHASIC COURSE: STUDY OF 704 CASES FOLLOWED FOR 6-12 MONTHS. *(Fr.)* Laverdant, C.; Cristau, P.; Essioux, H.; Molinie, C.; Malvy, J. L.; Alleaume, D. (Begin Mil. Hosp., Saint-Mande, France). *Arch. Fr. Mal. App. Dig.* 63(4):305-314, 1974.

Clinical symptoms and serum bilirubin, alkaline phosphatase, γ-globulin, the thymol turbidity test, SGPT, and hepatitis B antigen (HB Ag) were followed for 6 to 12 months in 704 patients (682 men and 22 women, mean age 23 yr) out of 778 hospitalized with viral hepatitis. Patients with fulminating hepatitis, cholestatic hepatitis, and hepatitis with an atypical onset were excluded. HB Ag was present in 15.2% of all patients and was not related to the course of the disease in these patients. According to the clinical symptoms and liver function tests, the course of viral hepatitis was monophasic in 67% of the patients, i.e. after reaching a maximum, clinical and biochemical disorders became progressively less pronounced until recovery was complete. In the remaining 33% of the patients, the course was multiphasic. Patients with a multiphasic course were classified into 3 subgroups: (1) 42.70% with one rebound occurring during the 3rd week and reaching a maximum around the 35th day; (2) 41.15% with one rebound occurring during the 4th week and reaching a maximum around the 50th day; and (3) 16.15% with 2 rebounds, the second of which occurred between the 50th and the 80th day. In contrast to relapses, which are defined as the recurrence of a new, complete set of clinical, biological, and pathological symptoms, identical to those observed at the onset, rebounds are only temporary biological disorders accompanied by nonspecific clinical symptoms (asthenia, anorexia, failure to regain lost weight). Relapses were less common than rebounds, occurring in only 8 of the original 778 patients. Among patients with a multiphasic course, a correlation was found between SGPT values and biopsy findings. Rebounds were accompanied by connective tissue lesions, particularly inflammatory infiltrates in the portal triad; little or no hepatocyte necrosis was observed. All of the patients with multiphasic courses recovered completely so that no specific treatment is justified.

2230 ACUTE FULMINANT HEPATITIS: A CLUSTERING OF CASES. *(E.)* Sheinbaum, A. J.; Damus, K. H.; Michael, T. D.; Gitnick, G. L. (Univ. California Los Angeles Cent. Health Sci.). *Arch. Intern. Med.* 134(6):1093-1094, 1974.

During a 10-wk period in a rural county, 48 cases of viral hepatitis were reported. Out of these 48 cases, 10 cases developed fulminant hepatitis. Seven of the fulminant hepatitis cases were studied to determine the contribution of host factors, environment, viral mutation or epidemiologic conditions to its occurrence. Hepatitis B antigen (HB Ag) subtyping by rheophoresis was carried out on the 5 patients who were HB Ag-positive; 4 of these were subtyped *ay* and 1 was *ad*. All patients were relatively young (18-26 yr old) and 4 were known parenteral drug users. There was no common water supply and, except for the possibility that 2 patients may have shared needles, there was no evidence that any of the other people were exposed to each other or to a common source. The 20.8% incidence of acute fulminant hepatitis among the 48 reported cases of acute viral hepatitis represents an extremely high morbidity in a relatively short time period (presently accepted rate is only 2%). This high incidence may represent a "clustering" of cases which is not a unique phenomenon but actually represents a common occurrence that was previously undetected. Two explanations are suggested for this clustering: 1) a unique but unidentified combination of host and environmental factors; and 2) a spontaneous viral mutation resulting in the development of an unusually virulent hepatitis virus strain whose virulence was unrelated to the presence or absence of HB Ag or any 1 of its subtypes.

2231 AUSTRALIA ANTIGEN IN HOSPITAL PATIENTS. *(Ger.)* Zollikofer, J. (Limmattal Blood Donor Cent., Schlieren/Zurich, Switzerland). *Z. Gastroenterol.* 12(3):201-208, 1974.

2232 TREATMENT OF SEVERE AND PROLONGED FORMS OF TYPES A AND B VIRAL HEPATITIS. *(Fr.)* Benhamou, J. P. (Beaujon Hosp., Clichy, France). *Cah. Med.* 14(9):805-810, 1973.

2233 CLINICAL EXPERIENCE WITH POLILEVO (PILLS) IN LIVER THERAPY. *(Ger.)* Rizzo, F.; Arcuri, F. (Munic. Hosp., Genoa, Italy). *Therapiewoche* 24(17):1957-1958, 1960, 1974.

2234 CELL-MEDIATED IMMUNITY TO HEPATITIS B ANTIGEN IN BLOOD DONORS WITH PERSISTENT ANTIGENAEMIA OR HIGH TITRE ANTIBODY. *(E.)* Lee, W. M.; Reed, W. D.; Mitchell, C. G.; Eddleston, A. L. W. F.; Dymock, I.; Williams, R. (King's Coll. Hosp., London, England). *Gut* 15(10):825, 1974.

2235 LIVER FUNCTION AND BLOOD CLOTTING IN PATIENTS WITH VIRAL HEPATITIS. *(Rus.)* Fedenko, Iu. I. (Voroshilovgrad Med. Inst., USSR). *Klin. Med. (Mosk.)* 52(8):102-107, 1974.

2236 LAPAROSCOPIC ASPECTS OF SUBACUTE NECROTIZING HEPATITIS. *(Ger.)* Knoblauch, M.; Lammli, J. (Dep. Intern. Med., Univ. Zurich, Switzerland). *Z. Gastroenterol.* 12(1):50, 1974.

2237 SOME HEMODYNAMIC PARAMETERS IN VIRAL HEPATITIS IN CHILDREN. *(Rus.)* Chernova, I. V.; Dik, G. A. (Chelyabinsk Med. Inst., USSR). *Vopr. Okhr. Materin. Det.* 18(12):13-15, 1973.

2238 BLOOD CLOTTING PARAMETERS IN EVALUATING THE SEVERITY OF HEPATOCYTE INSUFFICIENCY IN VIRAL HEPATITIS. *(Rus.)* Zhitar, V. D. (Kishinev Med. Inst., USSR). *Klin. Med. (Mosk.)* 52(11):93-97, 1974.

See also, 1919, 1920, 2178.

LIVER AND BILIARY TRACT

Chronic Hepatitis

2239 HEPATITIS B ANTIGEN AND ANTIBODY IN ACTIVE CHRONIC HEPATITIS AND OTHER LIVER DISEASES IN AUSTRALIA. A MULTICENTER COLLABORATIVE STUDY. *(E.)* Cooksley, W. G. E.; Powell, L. W.; Mistilis, S. P.; Mackay, I. R.; Barker, L. F. (R. Brisbane Hosp., Australia). *Am. J. Dig. Dis.* 20(2):110-114, 1975.

Radioimmunoassay for hepatitis B antigen (HB Ag) and anti-HB Ag was used to study the possibility that persistent antigen is involved in the pathogenesis of chronic active hepatitis. Sera from 85 patients with active chronic hepatitis, 83 with other liver diseases, 98 with non-liver diseases, and 67 healthy controls were assayed. HB Ag and anti-HB Ag were each found in 3 of the 85 active chronic hepatitis patients (4%). Of the other 248 patients, 9 were HB Ag-positive; 7 of these had liver disease other than chronic active hepatitis (8%). Seventeen of the 248, including 5 with liver disease other than chronic active hepatitis (6%), 8 from the non-liver disease patients (8%) and 4 from the controls (6%), were anti-HB Ag-positive. It is concluded that the low prevalence of the HB Ag indicates persistent hepatitis B virus infection is rarely relevant to pathogenesis of active chronic hepatitis in Australia.

2240 CHRONIC PERSISTENT HEPATITIS: PATHOLOGICAL AND CLINICAL STUDY OF 100 PATIENTS. *(Fr.)* Sidi, S.; Michel, H.; Peters, R.L.; Redeker, A. G. (John Wesley Hosp., Los Angeles, Calif.). *Arch. Fr. Mal. App. Dig.* 63(4):285-295, 1974.

Clinical, biochemical, serological and, in 89 cases, histological studies were performed systematically over a 2-12-yr period on 100 patients, 16-80 yr old (mean age 31 yr), who developed chronic persistent hepatitis as a sequela of acute icteric or anicteric hepatitis. All patients had transaminase levels of more than 50 Karmen U for at least 1 yr after the initial episode of hepatitis; none were alcoholics or had other chronic liver diseases. Few of these patients had signs of hepatic insufficiency; 16% had hepatomegaly and 3%, splenomegaly, but none had associated portal hypertension. Although SGOT and SGPT activities were increased, serum bilirubin, protein, and prothrombin levels were within normal limits in all or almost all cases; 30 min BSP retention was abnormal in 18% but was not related to transaminase activity. No relation was found between transaminase levels and severity of histological lesions. Punch liver biopsies showed minor histological lesions: swollen hepatocytes with a cobblestone appearance; apparent obliteration of the sinusoidal lumen; little or no fibrosis and necrosis; and dilation of the portal spaces with round cell infiltrates. These lesions were suggestive of a viral etiology which was confirmed in 30% by the presence of hepatitis B antigen; hepatitis B antibodies were detected in 5 patients, but they persisted in only 1. No patients had lupus erythematosis cells. Long-term followups revealed that none of these patients developed chronic aggressive hepatitis or cirrhosis. Transaminase levels remained the same in 32%, increased in 12%, and decreased in 56%. Although transaminase levels returned to normal after 3-10 yr in 30% of these patients, histological lesions never regressed completely. A controlled study of 40 patients demonstrated that prednisone (30 mg/day for 2 months) had no effect on serum transaminase levels which were likewise not affected by rest or exercise.

2241 THE REACTION OF SERUM ENZYMES AND METABOLITES TO A STANDARDIZED WALKING EXERCISE IN 140 PATIENTS WITH CHRONIC LIVER DISEASE. *(Ger.)*

Muting, D.; Hammes, P. H.; Ecknauer, R. (Prof. Kalk Spec. Clin. Liver Dis., Bad Kissingen-Hausen, Germany). *Munch. Med. Wochenschr.* 116(43):1873-1880, 1974.

Serum enzymes and metabolites were measured in 20 normal subjects and 140 patients with chronic liver diseases 1 and 24 hr after the subjects performed a standardized walking test (6 km in 60 min). The enzymes measured were sorbitol dehydrogenase (SDH), glutamic dehydrogenase (GLDH), SGOT, SGPT, and creatine phosphokinase (CPK), and the metabolites were glucose, lactate, triglycerides, plasma ammonia, and free serum phenols. All enzyme and metabolite levels increased in the controls, and SDH, GLDH, and ammonia levels increased in patients recovering from hepatitis. Changes in SDH, GLDH, and SGPT following physical exercise were in the same direction in almost all patients. The GLDH activity increased in patients with chronic persistent, and decreased in those with chronic aggressive hepatitis. Increased plasma ammonia levels and inversion of the SGOT:SGPT ratio were observed in patients with complete cirrhosis and little inflammation. Patients with chronic aggressive hepatitis had the most pronounced increases in the activities of all enzymes and in ammonia levels. In patients with fatty liver, GLDH was the most sensitive indication of hepatocyte damage. Lactate levels were highest in obese patients with fatty liver who engaged in little physical activity. Except for patients with chronic aggressive hepatitis and pronounced inflammation, walking exercise was tolerated well by all patients. Improvements in the results of these tests occurred during recovery from hepatitis.

2242 CELL-MEDIATED IMMUNITY TO HUMAN TAMM-HORSFALL GLYCOPROTEIN IN AUTOIMMUNE LIVER DISEASE WITH RENAL TUBULAR ACIDOSIS. *(E.)*

Tsantoulas, D. C.; McFarlane, I. G.; Portmann, B.; Eddleston, A. L. W. F.; Williams, R. (King's Coll. Hosp. Med. Sch., London, England). *Br. Med. J.* 4(5943):491-494, 1974.

Cell-mediated immune responses to Tamm-Horsfall glycoprotein isolated from human urine were investigated using the leukocyte migration test. The 71 patients studied included 24 with active chronic hepatitis, 24 with primary biliary cirrhosis, and 23 with various liver diseases not attributable to autoimmunity. These final 23 patients included those with alcoholic cirrhosis (6), liver damage from paracetamol overdose (4), idiopathic hemachromatosis (3), halothane hepatitis (2), primary hepatocellular carcinoma (2), extrahepatic obstructive jaundice (2), carbon tetrachloride liver injury (1), liver damage from *Amantia phalloides* (2), and hepatic hydatid disease (1). Sixteen healthy controls were also studied. None of the patients had overt renal tubular acidosis (RTA) but 7 of 24 patients with active chronic hepatitis (29 (29%) and 4 of 24 with primary biliary cirrhosis (17%) had the incomplete type. Abnormal leukocyte migration responses were found in 91% of the patients with active chronic hepatitis or primary biliary cirrhosis with an associated renal tubular acidosis (inhibition in 5 and stimulation in 5) but in only 19% of those without renal tubular acidosis. Among the 23 patients with non-autoimmune liver diseases, there were only 2 who had abnormal migration indices; in the control group, the results were within normal limits. In addition, using an immunofluorescent technique with rabbit antibody to Tamm-Horsfall glycoprotein, the presence of a material reacting immunologically as Tamm-Horsfall was shown in the human liver cell membrane. These findings suggest that the development of an immune response to this glycoprotein, initiated by release of cross-reacting antigens from damaged hepatocytes, could be the mechanism underlying the occurrence of renal tubular acidosis in some patients with autoimmune liver disease.

2243 CHRONIC AGGRESSIVE (LUPOID) HEPATITIS: DIAGNOSIS, DIFFERENTIAL DIAGNOSIS, AND THERAPY. *(Ger.)*

Berg, P. A.; Brandt, H. (Med. Clin., Univ. Tubingen, Germany). *Therapiewoche* 24(6):521-522, 525-526, 528, 531-532, 534, 537-538, 540, 543-544, 1974.

2244 ELECTROCARDIOGRAPHY IN PATIENTS WITH CHRONIC HEPATITIS AND CIRRHOSIS. *(Rus.)*

Olbinskaia, L. I.; Gorbatenko, V. P.; Migachev, V. N. (I. M. Suchenov 1st Moscow Med. Inst., USSR). *Klin. Med. (Mosk.)* 52(8):113-115, 1974.

See also, 2168, 2186.

LIVER AND BILIARY TRACT

Alcoholic Liver Disease

2245 TWO NEW TESTS FOR THE EARLY DETECTION OF ALCOHOLIC CIRRHOSIS. *(Fr.)*

Belanger, M.; St. Hilaire, D.; Lessard, A. (Chicoutimi Hosp., Canada). *Union Med. Can.* 103(9):1557-1563, 1974.

Comparisons of blood protein fractions were made on (1) 43 patients with clinical and biological signs of alcoholic cirrhosis (mean age 54 yr), (2) 400 chronic male alcoholics, aged 18-74 yr (mean age 49 yr) with no clinical signs of active cirrhosis, and (3) 200 controls, aged 15-60 yr with no clinically diagnosed disease which could affect the results.

All but 6 of the cirrhotics had IgA levels of 400 mg/100 ml or higher (mean 642 mg/100 mg) which were accompanied, in some cases, by increases in IgG levels. Transferrin concentrations (mean 146 mg/100 ml) were low in all of the cirrhotics, averaging 53% of normal, and a correlation was found between transferrin and albumin levels. The ratio of IgA:transferrin ranged from 2 to 16 in this group. IgA and transferrin levels and the IgA:transferrin ratio provided an accurate indication of the extent of fibrosis. Large variations were found in ceruloplasmin, haptoglobin, and antitrypsin concentrations, and the test for α_1-fetoprotein was negative on all of these cirrhotics. Of the 400 chronic alcoholics, 337 had no significant protein abnormalities associated with alcohol abuse while 63 had IgA levels of 394 mg/100 ml or higher and decreased transferrin concentrations; the ratio of IgA:transferrin averaged 3.41 with an upper limit of 7.18 in the latter group. Ceruloplasmin concentrations were low, but this might have been caused by factors other than alcoholism. It is recommended that IgA and transferrin concentrations and the IgA:transferrin ratio be used to diagnose alcoholic cirrhosis in its early stages.

2246 ANALYSIS OF THE RESULTS FROM CLEARANCE OF CONTINUOUSLY PERFUSED INDOCYANINE GREEN IN PRECIRRHOTIC AND CIRRHOTIC ALCOHOLICS. *(Fr.)* Traissac, F. J.; Paccalin, J.; Montantin, C. (St. Andre Hosp., Bordeaux, France). *J. Med. Lyon* 54(1241): 101-108, 1973.

A "pre-cirrhotic" state of alcoholics was characterized according to the hepatic involvement as shown by the clearance curve of indocyanine green. The subjects included 13 control subjects, 7 declared alcoholics who presented no clinical symptoms, 7 alcoholics with nondecompensated cirrhosis, and 19 alcoholics with decompensated cirrhosis. Indocyanine green was perfused at 3 different concentrations and arterial blood samples began to be drawn after 30 min. The optical density of the plasma was measured, and the plasma volume was determined by radioionized albumin. The differences between the constant of proportionality between plasma concentration and intrahepatic dye fixation for the alcoholic subjects as compared with the control subjects was not significant, but the calculated maximum amount of dye transported did drop significantly for the non-clinical alcoholics compared with the control subjects, and more for the clinically alcoholic subjects. The technique is still experimental, but the results suggest the indocyanine green test may be able to predict the prospects of liver cirrhosis by the lowering of the maximum amount of dye transported before the standard tests for liver function. The test has the advantage for research of sensitivity.

2247 PRESENCE OF SERUM α-1-FETOPROTEIN IN ALCOHOLIC HEPATITIS. *(E.)* Miller, A. I.; Moral, M. D.; Schiff, E. R. (VA Hosp., Miami, Fl.). *Gastroenterology* 68(2):381-383, 1975.

A case is presented of α_1-fetoprotein detected in association with alcoholic hepatitis. A 53-yr-old man with a history of chronic alcoholism presented with anorexia, malaise, and jaundice. Laboratory findings were consistent with a diagnosis of alcoholic hepatitis, but counterimmunoelectrophoresis of serum revealed the presence of α_1-fetoprotein to a dilution of 1:8. Liver scan, laparoscopy, and biopsy failed to disclose any malignancy. Treatment with bed rest and diuretics resulted in improved condition, and α_1-fetoprotein positive reaction disappeared from the serum, with no recurrence. It is suggested that in patients positive for α_1-fetoprotein, but displaying no other indications of neoplastic invasion alcoholic hepatitis should be considered as a possible cause.

2248 INTRACTABLE ASCITES IN ALCOHOLIC CIRRHOSIS: TREATMENT BY REINJECTION OF ASCITES FLUID COMBINED WITH DIURETICS. *(Fr.)* Perrin, D.; Bredoux, P.; Arzul, C.; Bergerault, P.; Dedieu, P.; Miniconi, P. (St. Jacques Hosp., Nantes, France). *Arch. Fr. Mal. App. Dig.* 63(5):365-373, 1974.

Intractable ascites accompanying alcoholic cirrhosis in 32 patients (23 men and 9 women) was treated by aspiration of ascites fluid which was then infused i.v. at rates ranging from 300 to 1200 ml/hr (mean 645 ml/hr). The total fluid infused ranged from 1.5 to 8 liters/day (mean 5.77 liters/day). This technique was used in 37 hospitalizations of these 32 patients and was combined with bed rest, a low-sodium diet (22 mEq/day), and KCl (1-3 g/day) in all cases; 16 patients also received prednisolone (20-30 mg/day). Infusions of ascites fluid were given without diuretics in 50 cases and with p.o. or i.v. diuretics in 136 Furosemide (mean dose 60 mg/day) and spironolactone (mean dose 350 mg/day) were given, either alone or in combination. Half of the patients received antibiotics (ampicillin or penicillin, colistin or gentamycin) systemically on the days of infusion. Short-term followups showed that treatment was ineffective in 4 cases; all of these patients died with kidney failure, uremia, severe hyponatremia, and hyperkalemia. Some improvement occurred in 10 patients, but 2 died of gastrointestinal bleeding and 3 of kidney failure; only 1 of 3 patients who developed recurrent ascites several weeks after treatment benefitted from repeated infusions of ascites fluid. Ascites disappeared for long periods in 18 patients (23 hospitalizations), but 2 of these patients died of hemoperitoneum and gastrointestinal bleeding, resp. Long-term followups of 18 patients revealed that 15 are alive and in good health 1 yr after treatment. Long-lasting results were obtained only when infusion of ascites fluid was combined with administration of diuretics, particularly spironolactone, and a low-sodium diet. It is recommended that 6 liters/day of ascites fluid be infused at a rate of 600 ml/hr and that spironolactone (100-400 mg) be given 3 or 4 days/week. Antibiotics did not appear to prevent infections; it is suggested that corticosteroids be discontinued.

2249 STUDY OF CHRONIC FIBRINOLYSIS IN ALCOHOLIC CIRRHOSIS. *(Fr.)* Thuot, C.; Perron, L. (St. Luc Hosp., Montreal, Canada). *Union Med. Can.* 103(8):1400-1404, 1974.

The effect of heparin (200 U/kg/24 hr infused i.v. for at least 48 hr) on blood clotting and fibrinolysis was studied in 12 patients with alcoholic cirrhosis complicated by chronic fibrinolysis. Patients were hospitalized for hepatic decompensation which was associated, in some cases, with alcoholic hepatitis. None of these patients had secondary obstructive jaundice and none had bleeding with the exception of ecchymosis or rare nosebleeds. Heparin rapidly corrected fibrinolysis in 6 of these patients and had no effect in the remaining 6 cases. Patients who responded to heparin therapy initially had moderate thrombopenia; moderately reduced fibrinogen; chronic fibrinolysis, as demonstrated by accelerated plasma euglobulin lysis; a slight increase in fibrinogen degradation products; a prolonged thrombin time; and moderately decreased plasminogen. Factors V and VIII were within normal limits, and no evidence of paracoagulation (cryofibrinogen and soluble complexes) was found. Heparin corrected the rate of fibrinolysis and increased fibrinogen levels rapidly and increased the platelet count slowly until it reached the lower normal range in 4 patients. However, in some patients accelerated fibrinolysis recurred 48 hr after discontinuation of heparin infusion. The findings suggest that patients responding to therapy had intravascular coagulation with secondary physiological lysis. The failure of heparin to correct fibrinolysis in the remaining 6 patients suggests that they had systemic or primary fibrinolysis with no evidence of disseminated intravascular coagulation.

2250 CLINICAL PROBLEMS OF ALCOHOLIC CIRRHOSIS. I. BIOLOGICAL AND CLINICAL FEATURES OF ALCOHOLIC CIRRHOSIS. *(Ser.)* Knezevic, S.; Falisevac, V.; Kallai, L.; Hadzic, N.; Pichler, E.; Spicer, F. (Med. Fac., Zagreb, Yugoslavia). *Acta Med. Iugosl.* 28(4):339-353, 1974.

2251 ALCOHOLIC FATTY LIVER. *(It.)* Pasquazzi, M. (St. Filippo Neri Hosp., Rome, Italy). *Policlinico* [*Prat.*] 81(1):1-13, 1974.

2252 ALCOHOLIC CARDIOMYOPATHY WITH HYPERFERREMIA CAUSED BY EXCESSIVE GASTROINTESTINAL ABSORPTION OR IRON. *(Fr.)* Auzepy, P.; Valette, H.; Albessard, F.; Deparis, M. (Bicetre Hosp., Paris, France). *Ann. Med. Interne* 125(12):923-926, 1974.

See also, 2253.

LIVER AND BILIARY TRACT

Cirrhosis

253 HETEROZYGOUS ALPHA-ANTITRYPSIN DEFICIENCY AND CIRRHOSIS IN ADULTS, A FORTUITOUS SSOCIATION. *(E.)* Morin, T.; Feldmann, G.; Ben- amou, J. P.; Martin, J. P.; Rueff, B.; Ropartz, . (Beaujon Hosp., Clichy, France). *Lancet* 1(7901): 50-251, 1975.

he frequency of the different genotypes of serum α_1-antitrypsin deficiency was compared in 169 irrhotic and 394 healthy subjects. Cirrhosis was istologically proven in 105 and was of apparent lcoholic origin in 132. There was no significant ifference between normal and cirrhotic patients n the frequency of protease inhibitor genotypes M, MS, MZ or other minor ones, or the alleles M, , Z, and the other alleles. It is concluded that reviously observed correlations between cirrhosis nd heterozygous α_1-antitrypsin deficiency are merely ortuitous.

254 CIRRHOSIS ASSOCIATED WITH PARTIAL DEFICIENCY OF ALPHA-1-ANTITRYPSIN: A CLINI- AL AND AUTOPSY STUDY. *(E.)* Craig, J. M.; Dunn, . F. G.; Peters, R. L. (Univ. South. Calif. Sch. ed., Los Angeles). *Hum. Pathol.* 6(1):113-120, 975.

case history of a 63 yr old Mexican female with cirrhosis associated with a partial deficiency of α_1-antitrypsin is presented. The patient was admitted for treatment of uncontrolled diabetes and had a questionable history of esophageal varices in 1966. In 1971, the patient had hepatosplenomegaly with ascites, palmar erythema and a few spider angiomas. She denied ethanol abuse. Blood chemistry studies showed a serum albumin of 3.2 g%, serum globulin of 3.7 g% (α_1, 0.1 g%, α_2, 0.15 g%, β, 0.9 g%, γ, 2.2 g%), α_1-antitrypsin of 135 mg% (normal = 200-400 mg%), serum trypsin inhibitory capacity of 0.598 U (normal = 0.85-1.60), and normal serum bilirubin, SGOT and SGPT levels. P_i typing showed an SZ phenotype. Tests for hepatitis B antigen, L.E. cells, mitochondrial, antinuclear and smooth muscle antibodies and α-fetoprotein were negative. Liver biopsy revealed eosinophilic cytoplasmic inclusions in a few hepatocytes and features suggestive of cirrhosis. The patient was later readmitted in hepatic coma with gastrointestinal bleeding and died. At autopsy, the liver contained multiple nodules. The eosinophilic cytoplasmic inclusions were again noted in formalin-fixed sections and were strongly positive to diastase digested PAS and with alcian blue. Fluorescence microscopic studies with labeled antibody to α_1-antitrypsin showed positive vesicular structures within the cytoplasm of hepatocytes at the periphery of the nodules with decreasing fluorescence in hepatocytes closer to the center of the nodules. All hepatocytes contained large amounts of dilated granular endoplasmic reticulum cisternae filled with low density homogeneous flocculant material. These findings suggest that at least 1 of the heterozygous P_i phenotype α_1-antitrypsin deficiencies may be associated with hepatic cirrhosis in adults.

2255 OXYGEN TRANSPORT IN NON-HYPOXAEMIC CIRRHOTIC PATIENTS.

(E.) Verdier, F.; Hakim, J.; Sraer, J.; Fag, M.; Boucherot, J.; Troube, H.; Drutel, P. (INSERM, Beaujon Hosp., Paris, France). *Biomedecine* 21(6):268-271, 1974.

Oxygen transport was studied in 11 cirrhotic patients without hypoxia, but who were hypocapnic and anemic. In addition to arterial O_2 and CO_2 partial pressures, O_2 saturation and pH, intraerythrocyte ATP, 2,3-diphosphoglycerate and O_2 partial pressure at 50% saturation were also determined. Results of arterial blood gases showed a mean O_2 partial pressure of 93.1 Torr and a mean O_2 saturation of 97.9%. Patients, however, were alkalotic (plasmatic pH of 7.47; intraerythrocyte pH of 7.25), hypocapnic (CO_2 partial pressure Torr) and anemic (hemoglobin of 10.6 gm%). Blood ATP levels were decreased from the control value of 4.33 μM/gm hemoglobin to 3.05 μM/gm. 2,3-Diphosphoglycerate levels were increased to 19.2 μM/gm hemoglobin (control = 14.0 μM/gm.) Partial O_2 pressure at 50% saturation was also significantly increased to 28.9 Torr (control = 25.9). There was no significant correlation between 2,3-diphosphoglycerate levels and partial O_2 pressure at 50% saturation. These patients thus exhibited a lowered O_2 affinity, as previously reported, which ensures a good O_2 supply to the tissues. The alkalosis was apparently responsible for the increased 2,3-diphosphoglycerate levels observed.

2256 EFFECT OF ORNITHINE α-KETOGLUTARATE ON HIGH BLOOD LEVELS OF AMMONIA INDUCED IN CIRRHOTICS.

(Fr.) Peter, B.; Imler, M.; Tongio, J.; Schlienger, J. L.; Stahl, J. (Univ. Hosp. Cent., Strasbourg, France). *Ann. Gastroenterol. Hepatol.* 10(3):179-196, 1974.

Continuous determination of blood ammonia levels were performed on 20 fasting male cirrhotics, aged 35-80 yr, using a Technicon Autoanalyzer before and after ingestion of 5 g ammonium acetate dissolved in 100 ml water. Of these patients, 19 had clinically compensated cirrhosis and 7 had decompensated cirrhosis (jaundice and/or ascites); only 1 had a transitory hepatic precoma following gastrointestinal bleeding several weeks before. Blood ammonia levels returned to their initial values within 2 hr in all these subjects. When ammonia levels returned to their initial values, 16 cirrhotics were given a second dose of ammonium acetate followed immediately by i.v. infusion of 25 mg ornithine α-ketoglutarate (OAKG), dissolved in 250 ml physiological saline, over a 1 hr period; 10 cirrhotics served as controls. Within 1-5 min after ingestion of ammonium acetate, arterial ammonium concentrations increased, and this increase persisted for 60-120 min. Curves differed greatly from one patient to another with ammonia levels reaching a maximum 5-93 min after ingestion of ammonium acetate. Peripheral venous levels of ammonia were always lower than arterial levels, and the difference between arterial and venous levels showed great individual variation. Infusion of OAKG in 16 cirrhotics after ingestion of ammonium acetate resulted in a variable and incomplete decrease in arterial ammonia levels which averaged on the order of 34%. Simultaneous recordings of arterial and venous ammonia levels in 9 cirrhotics failed to demonstrate that OAKG had any effect on ammonia utilization in the muscles. In 3 other cases, simultaneous recording of ammonia levels in arterial and subhepatic venous blood showed that OAKG stimulates hepatic utilization of ammonia but has no effect on portal blood shunted around the liver by portacaval anastomoses. From a practical standpoint, the therapeutic effect of OAKG on high blood ammonia levels in cirrhotics is limited by liver function and, even more, by perihepatic shunting of portal blood. For this reason, the use of OAKG is not recommended for reducing high blood ammonia levels found in hepatic coma.

2257 BILE ACID METABOLISM IN CIRRHOSIS. IV. CHARACTERIZATION OF THE ABNORMALITY IN DEOXYCHOLIC ACID METABOLISM.

(E.) Yoshida, T.; McCormick, III, W. C.; Swell, L.; Vlahcevic, Z. R. (VA Hosp., Richmond, Va.). *Gastroenterology* 68(2): 335-341, 1975.

Cirrhotic and non-cirrhotic patients were studied to determine the mechanism of faulty deoxycholic acid metabolism in cirrhosis. Eight cirrhotic, and 5 normal males were given 5 Ci of ^{14}C-cholic or deoxycholic acid by enema, and 4 cirrhotic males were given 450 mg/day of cholic acid p.o. for 3 days. In addition, fecal bile acids were determined in 12 controls and 9 cirrhotic patients not given exogenous bile acids. In the cirrhotic patients given the deoxycholic acid enemas the bile level of that acid showed a significant increase after 2-4 hr, while the chenodeoxycholic acid level was not affected. Normal controls showed no effect. After 24 hr, 95% of the deoxycholic acid still retained the label in all cases, but the appearance of the label in the bile was much slower in the cirrhotic patients. In cirrhotic patients given the cholic acid enemas, bile composition was not affected, though some label was found in the bile. It was also noted that in the most severe cases of cirrhosis, cholic acid was converted to deoxycholic acid much more slowly. Of the 4 given cholic acid p.o., deoxycholic acid levels were raised slightly in 2 patients with originally low levels, and unchanged in those with normal original levels (2). Biliary cholic acid levels were increased in all 4. In the fecal sample experiments, it was found that cirrhotics had a significantly lower % deoxycholic acid level than did controls, while the secondary bile acid levels were significantly higher. Lithocholic acid levels were the same in both groups. The results suggest that impaired intestinal absorption may account for biliary deoxycholic deficiency in cirrhosis, and lack of cholic acid substrate is probably not a major factor. Fecal analysis suggests that some cirrhotic patients may be deficient in colonic bacteria or enzymes that favor conversion of cholic to deoxycholic acid.

2258 PROGNOSTIC VALUE OF THE IgA:TRANSFERRIN RATIO IN CIRRHOSIS. *(Fr.)*

Paris, J.; Jaillard, J.; Paris, J. C.; Sezille, G.; Fruchart, J. C.; Voiment, Y. M. (no affil.). *Bull. Acad. Natl. Med. (Paris)* 158(1):96-99, 1974.

Radial immunodiffusion was used to measure IgA and transferrin, and differences in the IgA:transferrin ratio were analyzed in 132 adults including: (1) 13 with acute hepatitis; (2) 11 with chronic cirrhogenous hepatitis; (3) 13 with primary or secondary liver cancer; (4) 80 with alcoholic cirrhosis; and (5) 15 controls with no evidence of liver disease or chronic alcoholism. Patients with alcoholic cirrhosis were further classified into 4 subgroups: (a) 14 chronic alcoholics with some clinical and biological signs suggestive of cirrhosis, but no jaundice, edema, ascites, or gastrointestinal bleeding; (b) 30 patients with known cirrhosis who responded to diuretics; (c) 19 cirrhotics who had at least 2 episodes of decompensation but who were in satisfactory condition; and (d) 17 with rapidly evolving cirrhosis who died in hepatic coma within several months. No patients who died of gastrointestinal bleeding were included in group (d). Comparison of mean IgA:transferrin values showed no significant difference between patients with acute hepatitis (1.60) and controls (1.9). Highly significant increases were found in chronic cirrhogenic hepatitis (3.92) and liver cancer 2.48). In alcoholic cirrhosis, IgA:transferrin values ranged from 3.64 in group (a) to 15.10 in group (d). Decompensation of cirrhosis was accompanied by a significant increase in the mean value. Determination of the IgA:transferrin ratio is recommended as a method for establishing both a diagnosis and prognosis for alcoholic cirrhosis.

2259 USE OF BUMETANIDE IN THE TREATMENT OF ASCITES DUE TO LIVER DISEASE. *(E.)*

Moult, P. J. A.; Lunzer, M. R.; Trash, D. B.; Sherlock, S. (R. Free Hosp., London, England). *Gut* 15(12):988-992, 1974.

Seventeen patients with ascites from chronic liver disease were treated with bumetanide to evaluate its performance and side effects. All had daily sodium and potassium intakes of 22 and 50 mEq, resp., a daily fluid intake of 1 liter. Body weight was stabilized and the drug initially administered at a dose of 1 mg/day and varied later (in the range of 1/2-4 mg/day) according to weight loss, urine output and sodium excretion. Patients were examined daily for hepatic encephalopathy, weighed, and had urine specimens collected for 24 hr volume estimation and electrolyte composition. Plasma electrolytes, urea and postprandial blood sugar were estimated 3 times/week. Thirteen responded to the initial 1 mg dose with a weight loss of 0.58 kg/day, 1 patient responded to a dose of 2 mg, and 1 died of hemorrhaging esophageal varices. In 2 others, diuresis occurred, but sodium excretion was less than intake. One responded to a 2 mg dose, but the other died of bleeding from esophageal varices. Over an average of 21 days of treatment, weight loss averaged 6.4 kg/day. No significant changes were found in blood glucose, uric acid, creatinine, calcium, phosphate, bilirubin, aspartate transaminase, or alkaline phosphatase. Six patients required a potassium-sparing diuretic to achieve control. It is concluded that bumetanide is an effective treatment for ascites in liver disease, but all patients should recieve supplementary potassium chloride or potassium-sparing diuretics.

2260 DETERMINATION OF THE PATENCY OF A SPLENORENAL SURGICAL ANASTOMOSIS. CREATININE AND UREA AS INERT MARKERS OF THE PORTAL BLOOD STREAM. *(E.)*

Gips, C. H.; Que, G. S.; Trip, J. A. J. (Univ. Hosp., Groningen, Netherlands). *Acta Hepatogastroenterol. (Stuttg.)* 21(5):346-351, 1974.

Shunt patency was assessed in 4 patients with cryptogenic macronodular cirrhosis following splenorenal anastomosis for repeated bleeding from esophageal varices. Patency was determined from measurements of simultaneous arterial and left renal venous blood following loading with 5 g ammonium acetate p.o. In 2 patients in whom both pre- and postoperative studies were conducted, the elevation of arterial ammonia was smaller before (100-200 μg%) than after (>400 μg%) surgery, suggested shunt patency. Catheterization of these 2 patients postoperatively revealed hepatic sinusoidal pressures (wedged hepatic venous free pressure) of 5 and 12 mm Hg (normal, 0-3). Following p.o. loading with creatinine (5 g) and urea (20-30 g) in 1 patient, the resp. concentrations in the left renal vein and artery showed the same patterns of increase as did the ammonia level after loading, whereas hepatic vein concentrations were lower. This patient was subsequently found to have a patent shunt on autopsy following death from hepatocellular carcinoma. These studies suggest that ammonia, urea and creatinine loading may be used to assess shunt patency as well as direction of main portal blood flow following splenorenal anastamosis: if renal vein creatinine of urea concentration after loading exceeds hepatic vein concentration, blood flow is hepatofugal; if *vice versa*, flow is hepatopetal.

2261 COMPARATIVE STUDY OF BASAL ARTERIAL AMMONEMIA AND OF ORALLY INDUCED HYPERAMMONEMIA IN CHRONIC PORTAL SYSTEMIC ENCEPHALOPATHY, TREATED WITH NEOMYCIN, LACTULOSE, AND AN ASSOCIATION OF NEOMYCIN AND LACTULOSE. *(E.)*

Pirotte, J.; Guffens, J. M.; Devos, J. (Baviere Hosp., Liege, Belgium). *Digestion* 10(6):435-444, 1974.

The effects of neomycin and lactulose, separately and in combination, were studied with respect to ammonia metabolism in chronic portal systemic encephalopathy in 9 cirrhotic patients. The encephalopathy was corrected and the patients stabilized with regard to urea level, blood pH, kalemia, and hepatic biology, by means of a salt-free, low protein diet. Once stabilized, the subjects were given 15 g lactulose 3 times/day for 5 days followed by 5 days of no treatment. When the effects of lactulose had worn off, they were given 250 mg neomycin 4 times/day for 10 days, then lactulose (45 g) was added to the neomycin for the next 12 days. Fasting arterial ammonia, and oral ammonia load tests were performed regularly during the different periods of treatment. Both the neomycin and the lactulose individually were found to reduce significantly the basal ammonemia to the same degree. The combination of both, however, reduced the values significantly lower than either by itself. The oral load tests showed that neomycin improved ammonia tolerance slightly, while lactulose improved it significantly, and both together had a significantly greater effect than either alone. It is concluded that both drugs together reduce colonic absorption more than either alone, presumably because the neomycin in short term small doses spares the colonic flora that break down lactulose into its active ingredients.

2262 THE HEMODYNAMICS OF PORTAL HYPERTENSION REVISITED: DETERMINANTS AND SIGNIFICANCE OF OCCLUDED PORTAL PRESSURES.

(E.) Moreno, A. H.; Burchell, A. R.; Reddy, R. V.; Panke, W. F.; Nealon, Jr., T. F. (St. Vincent's Hosp., New York, N.Y.). *Surgery* 77(2):167-179, 1975.

Portal blood flow was measured by square wave electromagnetic flowmeter in 153 cirrhosis patients about to be submitted to portacaval anastamosis. In addition, occluded portal pressures were determined by manometry in a subgroup of 80 patients and portal and hepatic artery flows were measured in 50 patients. Portal vein flow averaged 447 ml Hg/min and free portal pressure, 28.5 mm Hg (387 mm H_2O), in agreement with earlier findings. The incidence of stagnant flows (only to and from motions synchronous with respiration) was only 8.5%. Hepatic and splanchnic pressures measured after occlusion of the portal vein averaged 320 and 441 mm H_2O, resp. In 9 of these patients, hepatic occluded portal pressure was higher than either or both the free portal pressure and the splanchnic occluded pressure; however, 7 had forward flow into the liver from 80-1116 ml Hg/min and flow in the remaining 2 was stagnant. Analysis of these results indicated that alteration of the hepatic occluded portal pressure with respect to splanchnic occluded portal pressure is primarily determined by hepatic arterial resistance and hepatic venular outflow resistance on one side and splanchnic arterial resistance on the other. It is concluded that spontaneous reversal of portal flow in cirrhosis does not necessarily occur when hepatic occluded portal pressure exceeds either or both the free portal pressure or the splanchnic occluded portal pressure as measured in this study.

2263 PRIMARY BILIARY CIRRHOSIS: DIFFICULTY IN ESTABLISHING AN EARLY DIAGNOSIS.

(Fr.) Hofstetter, J. R.; Realini, S.; Fontolliet, C.: Gardiol, D. (Canton. Hosp., Lausanne, Switzerland). *Schweiz. Med. Wochenschr.* 104(50):1880-1882, 1974.

Of 10 women with primary biliary cirrhosis, 2 were diagnosed in the early stages. At onset both patients had pruritus, antimitochondrial antibodies, and increased serum alkaline phosphatase levels; 1 had increased IgM levels. Biopsies showed portal infiltration, bile duct lesions and, in 1 case, granulomas with giant cells; no signs of cholestasis were evident. Administration of azathioprine caused the pruritus to disappear and laboratory findings to improve in both patients, but when therapy was discontinued, exacerbations developed. Therefore, immunosuppressive therapy should probably be continued over a long period. Primary biliary cirrhosis can be differentiated from chronic hepatitis by increases in IgM and alkaline phosphatase, the absence of cytolysis, and the presence of antimitochondrial antibodies. It is important to diagnose primary biliary cirrhosis in its early stages so that immunosuppressive therapy can be instituted.

2264 LIVER SCHISTOSOMIASIS AND PRIMARY CIRRHOSIS. A CLINICO-PATHOLOGICAL STUDY.

(E.) Berthoud, S.; Cox, J. N.; Thiebaud, G.; Bouzakoura, C. (Dep. Med., Univ. Geneva, Switzerland). *Virchows Arch.* [*Pathol. Anat.*] 364 (3):285-294, 1974. (3):285-296, 1974.

The case of a 54-yr-old Swiss housewife suffering concomitantly from liver schistosomiasis and primary biliary cirrhosis is presented. The patient had traveled to Morocco, Madeira and the Canary Islands during recent holidays. A needle liver biopsy revealed, among other lesions, the presence of calcified fragments of schistosome ova in a portal tract. Laboratory findings revealed a raised erythrocyte sedimentation rate of 54/90 mm, hemoglobin of 14.5 g%, WBC of 5950/mm^3, and platelet count of 198000/mm^3. Urinalysis was normal. There were no bile pigments. Liver function tests were perturbed, showing in particular an increased alkaline phosphatase and the presence of antimitochondrial antibodies. The possibility of an autoimmune type of hepatic affection triggered by the presence of the schistosome eggs is suggested. Since the date of onset of either conditon, bilharzia or primary biliary cirrhosis, cannot be determined, it is suggested for the future that autoantibodies be determined, particularly antimitochondrial antibodies, not only in primary biliary cirrhosis and other chronic liver diseases, but also in cases of schistosomiasis of the liver.

2265 CIRRHOSIS: ITS MORPHOLOGICAL AND CLINICAL-CHEMICAL FEATURES.

(Ger.) Vido, I.; Schmidt, E.; Schmidt, F. W. (Med. Coll., Hannover, Germany). *Z. Gastroenterol.* 12(1):51, 1974.

2266 THE EFFECT OF PORTOCAVAL SHUNT ON COLON TRANSFER OF AMMONIA IN CIRRHOSIS OF THE LIVER.

(E.) Sein, M. M.; Hardy-Smith, A.; Shields, R. (Dep. Surg., Univ. Liverpool, England). *Gut* 15 (10):837, 1974.

2267 "PSEUDOSURGICAL" ACUTE ABDOMEN IN CIRRHOSIS.

(Fr.) Pedreira, J. D.; Villalonga, C.; Martinez-Vazquez, J. M.; Guardia, J.; Tornos, J.; Bacardi, R. (no affil.). *Cah. Med.* 15(3):131-135,1974.

2268 THE LYMPHATIC SYSTEM AND LYMPHATIC CYSTS IN THE CAPSULE OF THE CIRRHOTIC LIVER. *(Ger.)* Mielke, F.; Wegener, H. (Westend Clin., Free Univ., Berlin, Germany). *Z. Gastroenterol.* 12(3):169-178, 1974.

2269 RETROGRADE SPLENOPORTOGRAPHY. *(E.)* Wannagat, L. (Metab. Clin., LVA, Wurttemberg, Germany). *Acta Hepatogastroenterol. (Stuttg.)* 21(4):278-289, 1974.

2270 DIAGNOSIS OF ACUTE BLEEDING FROM ESOPHAGEAL OR GASTRIC VARICES IN PATIENTS WITH PORTAL HYPERTENSION. *(Rus.)* Shertsinger, A. G.; Tsorikaev, V. O. (All-Union Sci. Res. Inst. Clin. Exp. Surg., Moscow, USSR). *Klin. Khir.* (11):30-33, 1974.

2271 CURRENT DIAGNOSIS AND PREOPERATIVE THERAPY FOR PORTAL HYPERTENSION WITH BLEEDING AND NONBLEEDING ESOPHAGEAL VARICES. *(Ger.)* Schulz, D.; Kaufer, C.; Frommhold, H.; Paquet, K. J. (Surg. Clin., Rhenish Friedrich Wilhelm Univ., Bonn, Germany). *Therapiewoche* 24(5):385-386, 1974.

2272 HEMODYNAMIC CHARACTERISTICS OF DIFFERENT FORMS OF PORTAL HYPERTENSION (FROM ANGIOGRAPHIC DATA). *(Rus.)* Kuzin, M. I.; Savchenko, A. P.; Filimonov, G. P.; Pomelova, L. A. (I. M. Sechenov 1st Moscow Med. Inst., USSR). *Klin. Med. (Mosk.)* 51(11):20-26, 1973.

2273 WHICH PATIENTS WITH PORTAL HYPERTENSION SHOULD UNDERGO SHUNT SURGERY? *(Fr.)* Forster, E. (no affil.). *J. Med. Strasbourg* 4(11):741-744, 1973.

2274 EXPERIENCE IN THE SURGICAL TREATMENT OF PATIENTS WITH PORTAL HYPERTENSION. *(Rus.)* Zubov, D. S. (M. Gorky Med. Inst., Donetsk, USSR). *Klin. Khir.* (9):35-40, 1974.

2275 EMERGENCY TREATMENT OF HEPATIC COMA AND PORTACAVAL ENCEPHALOPATHY. *(Fr.)* Imler, M. (Univ. Hosp. Cent., Strasbourg, France). *Bull. Soc. Sci. Med. Grand Duche Luxemb.* 110(2):239-255, 1973.

2276 DIALECTICS IN THE CURING OF ASCITES IN CIRRHOSIS BY INTEGRATING TRADITIONAL CHINESE MEDICINE WITH WESTERN MEDICINE. *(Ch.)* Lin, T. K. (no affil.). *Kexue Tongbao* 19(8):349-351, 1974.

2277 VIRAL AND BACTERIAL ANTIBODIES IN PRIMARY BILIARY CIRRHOSIS AND OTHER CHRONIC LIVER DISEASE. *(E.)* Thomas, H. C.; Holden, R.; Ironside, J.; Somervilld, R. (Dep. Bacteriol. Immunol., Univ. Glasgow, Scotland). *Gut* 15(10):826, 1974.

2278 HYPERCATABOLISM OF THIRD COMPONENT OF COMPLEMENT IN PRIMARY BILIARY CIRRHOSIS. *(E.)* Potter, B. J.; Elias, E.; Jones, E. A. (R. Free Hosp., London, England). *Gut* 15(10):837, 1974.

2279 LAPAROSCOPIC FINDINGS IN PRIMARY BILIARY CIRRHOSIS. *(Ger.)* Schmid, M. (Waid Munic. Hosp., Zurich, Switzerland). *Z. Gastroenterol.* 12(1):48, 1974.

See also, 1941, 1942, 2168, 2172, 2186, 2196, 2241, 2242, 2244, 2249, 2250.

LIVER AND BILIARY TRACT

Gallbladder and Biliary Tract Diseases

2280 INTERPRETATIVE PROBLEMS IN ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY. *(E.)* Block, M. A.; Schuman, B. M.; Weckstein, M. L. (Henry Ford Hosp., Detroit, Mich.). *Am. J. Surg.* 129(1):29-33, 1975.

Of 41 patients with biliary tract problems studied by endoscopic retrograde cholangiopancreatography, interpretation of ductograms or endoscopic observations could not be accomplished with ease in 10. Although incomplete filling of the bile ducts usually signifies organic obstruction, complete filling was not achieved in 1 patient with the subsequent diagnosis of intrahepatic cholestasis and another with a known liver hamartoma and subsequent diagnosis of concomitant hepatitis. When obstructing lesions were present, their specific origin and histological character could not be delineated. A pancreatic carcinoma produced only partial obstruction of the bile duct sufficient to cause jaundice in 1 patient; in a patient with jaundice associated with pancreatitis, an endoscopic pancreatogram was consistent with this diagnosis, but a choledochogram could not be obtained. Other limitations of endoscopic cholangiography included difficulties in demonstrating minute stones in 2 patients, in recognizing anatomic variations that caused the pancreatic duct to be confused with the bile duct in 1 case, and in defining the status of recurrent strictures in a patient with Roux-en-Y loops. On endoscopic examination, inflammatory changes in the duodenal papilla simulated carcinoma in 1 case while an ampullary carcinoma simulated an inflammatory process in another. In a 3rd patient, changes at the ampulla produced by carcinoma at the head of the pancreas were interpreted as a probable ampullary carcinoma. It is noted that pancreatic ductograms were obtained in 2 patients with carcinoma of the ampulla of Vater and dilation of the pancreatic duct was observed in 2 patients with stones in the common bile duct. Biopsy of ampullary carcinomas did not provide histologic confirmation in 2 patients. When interpretative difficulties occur in endoscopic retrograde cholangiopancreatography, the findings should be correlated with other available clinical information.

2281 CARCINOMA OF THE GALLBLADDER. A STUDY OF 181 CASES.

(E.) Ohlsson, E. G.; Aronsen, K. F. (Malmo Gen. Hosp., Sweden). *Acta Chir. Scand.* 140(6):475-480, 1974.

The incidence of carcinoma of the gallbladder was analyzed during a 15-yr period in a well-defined and non-selected population served by 1 hospital and the clinical course of the disease followed. During the 15-yr period, 181 cases were diagnosed, an incidence of about 5/100,000 inhabitants/yr. There were 148 female and 33 male, 80% of whom were above 60 yr old. Gallstones were present in 88.4% of the patients. The carcinoma was very difficult to diagnose in an early phase. In 19% of the patients operated upon, the indication for surgery was cholelithiasis. In 53% the indication for surgery was jaundice, and in 18% it was a clinically suspect malignant disease in patients without jaundice. At the time of operation 20% of the cases were not diagnosed as carcinoma by the surgeon but by the pathologist who later examined the gallbladder. Of all patients undergoing operation, 34.5% were cholecystectomized. The rest were subjected to explorative laparotomy or to some type of surgical palliative procedure. The mean survival time of those cholecystectomized was 15.8 months and for those subjected to surgical exploration only 1.5 months. Only 3 patients survived for a longer time and all of these had carcinoma *in situ*. It is concluded that only carcinoma *in situ* can be treated radically and that in order to obtain better therapeutic results, carcinoma of the gallbladder must be diagnosed earlier than it presently is.

2282 A CLINICOPATHOLOGICAL REVIEW OF 68 CARCINOMAS OF THE GALLBLADDER.

(E.) Donaldson, L. A.; Busuttil, A. (Dep. Pathol., Univ. Glasgow, Scotland). *Br. J. Surg.* 62(1):26-32, 1975.

Sixty-eight gallbladder carcinomas were reviewed with regard to diagnosis and treatment. Fifty-one had symptoms and signs of acute or chronic cholecystitis, of which 25 had a palpable right hypochondrial mass, and 18 had jaundice. Long standing biliary disease was found in 33 patients by radiological and surgical methods, and the disease exceeded 1 yr in 25. No substantial weight loss was seen, even in extremely advanced cases. In 10 patients, the serum alkaline phosphatase test was positive, though there was no sign of biliary obstruction. It is suggested that partial hepatic resection be considered in treatment. It is concluded that long standing biliary disease and high serum alkaline phosphatase levels are diagnostic indications of gallbladder carcinoma.

2283 DOUBLE TRANSHEPATIC DRAINAGE. *(Fr.)*

Praderi, R.; Delgado, G.; Mazza, M.; Gomez Fossati, C.; Davidenko, N. (Manuel Quintela Hosp., Montevideo, Uruguay). *Lyon Chir.* 70(5):294-298, 1974.

Two transhepatic tubes were used to anastomose the right and left hepatic ducts separately to the intestine in 9 patients. These patients consisted of 3 with cancers involving the junction of the hepatic ducts and 3 with postoperative stenosis of the hepatic ducts which, in 2 cases, was recurrent. This technique was also used in 3 patients with recurrences of inoperable cancer. The use of these tubes simplified suturing of the right and left hepatic ducts to the intestine: 4 or 5 sutures were usually enough. This technique made it possible to control the caliber of the right and left hepaticojejunal anstomoses separately and prevented sutures from coming out by reducing pressures in the biliary tract and anastomosed intestinal loop. By combining this technique with transhepatic drainage through a double U-tube, it is possible to change and clean the tubes if they disintegrate or become clogged.

2284 INTRAHEPATIC CHOLANGIOENTERIC ANASTOMOSIS IN CARCINOMA OF THE HILUS OF THE LIVER.

(E.) Bismuth, H.; Corlette, M. B. (Paul Brousse Hosp Villejuif, France). *Surg. Gynecol. Obstet.* 140(2): 170-178, 1975.

The validity of 45 intrahepatic cholangioenteric anastomoses for carcinoma of the hilus of the liver was tested regarding complications and long term results. Cholangioenteric anastomosis is defined as mucosa to mucosa approximation of a bile duct to the intestine. Of the 45 patients, the anastomosis was to the left in 40, to the right in 3 and bilateral in 2. On the left, all were to the duct of the left anterolateral segment and 28 were by the round ligament approach. In the first postoperative month there were 2 deaths, 1 from renal failure and 1 from cholangitis. Of the remaining patients the average survival time was 13 months. Of 15 who died under 6 months, metastases were known to be present during surgery in 12. Long term complications were recurrence of jaundice in 7 and biliary infection in 5. It was found that good cholangiography is essential for confirmation of diagnosis, and for choosing the site for the anastomosis. Recurrent jaundice in 4 cases was attributable in par to poor cholangiogram interpretation. It is felt that this surgical procedure using the left anteriolateral duct has given excellent results, especially with the round ligament technique, and is recommended in cases of this type.

2285 HEPATIC PORTOENTEROSTOMY AND ITS MODIFICATIONS FOR 'NONCORRECTABLE' BILIARY ATRESIA.

(E.) Kasai, M. (Tohoku Univ. Sch. Med., Sendai, Japan). *Paediatrician* 3(3/5):204-212, 1974.

A follow-up study was conducted on survivors of biliary atresia of the "noncorrectable" type who had been treated by hepatic portoenterostomy. The operation was designed to remove the gallbladder and bile ducts replaced by fibrous tissue, or the tissue anterior to the portal vein when ducts were not identified, up to the porta hepatis, after which the bowel was anastomosed to the porta hepatis, using the duodenum or the jejunum in Roux-en-Y fashion. Of 57 patients on whom the operation was performed, 8 died during convalescence. Among the 49 survivors, active excretion of bile appeared after operation in 19 and was poor or nonexistent in the remaining 30 patients. Long-term survivors (10 of 19) were examined in March 1972, 1-17 yr after operation. Growth was within normal limits in 9 of 10. One patient showed marked retardation of physical growth and was diagnosed as having Turner's syndrome. Liver function tests showed nearly normal values except for 1 case of elevated bilirubin, 1 of elevated transaminase, and 1 of abnormal cephalin flocculation. Needle biopsy at varying intervals after operation indicated that changes of the hepatic parenchyma and ductular proliferation were improved rather rapidly, whereas recovery from fibrosis was slow and occasionally incomplete. Postoperative excretion of bile was not observed in any patient who had no remnant of the hepatic duct and was poor in those who had identifiable but fibrotic radicles. Patients having small patent radicles or fibrous mass at the porta hepatis, however, showed active excretion of bile after operation in about 50% of cases. There was also a close relationship between post-operative excretion of bile and size of bile ducts found on histological examination of the porta hepatis. Postoperative cholangitis was the primary cause of unfavorable results in patients who showed active excretion immediately after operation. When the surgical technique was modified to a double-Y hepatic portojejunostomy with external fistula, signs of cholangitis disappeared in 10 of 11 cases. Modifications of the hepatic portoenterostomy have now been carried out on 19 patients, 18 of whom survived. Postoperative bile excretion was good in 7 of 8 patients younger than 70 days but in only 2 of 10 older than 70 days. It is concluded that the majority of patients with biliary atresia may be curable if an adequate operation is carried out within the first 10 weeks of life.

2286 PREVALENCE OF CHOLELITHIASIS IN IDIOPATHIC LATE-ONSET IMMUNOGLOBULIN DEFICIENCY. *(E.)* Diaz-Buxo, J. A.; Hermans, P. E.; Elveback, L. R. (Mayo Clin. Found., Rochester, Minn.). *Ann. Intern. Med.* 82(2):213-214, 1975.

Fifty patients were studied to determine whether there was a correlation between idiopathic late-onset immunoglobulin levels below 30% of normal and an onset of cholelithiasis at least 7 yr after birth. Gallbladder roentgenograms or observations during surgery or autopsy were made on 37 (47%). Each of the 50 was classified according to the presence or absence of cholelithiasis at the last examination. A control group consisted of 500 patients who underwent abdominal surgery for benign upper gastrointestinal conditions. Twelve out of 50 (24%) with immunoglobulin deficiency had cholelithiasis, as opposed to 47 of the 500 controls (9.4%), a significant difference. It is concluded that there is an association between this type of immunoglobulin deficiency and cholelithiasis. It is suggested that the cholelithiasis developed because of a) a local abnormality in the gallbladder or b) decreased bile acid pool due to either excess intestinal loss of bile acids secondary to intestinal malabsorption or to a primary hepatic abnormality producing lithogenic bile.

2287 DISSOLUTION AND RETRIEVAL OF RETAINED COMMON DUCT STONES. *(E.)* Patterson, H. C.; Hothem, A.; Bream, C. (Dep. Surg., Univ. North Carolina, Chapel Hill). *Am. Surg.* 41(1):48-50, 1975.

Twenty-one cases of retained biliary duct stones were treated with 1 or a combination of 3 new techniques. First, dissolution was attempted with a continuous drip of 2500 U of lung heparin in 250 cc of saline, every 6 hr. Choledochography was done every 4 days. If the stones were unaffected, they were flushed with sodium cholate (30 mm/hr). Diarrhea was prevented during this treatment with cholestyramine. The cholate treatment was alternated with the heparin treatment every 24 hr when the patients showed intolerance to the straight cholate. To overcome inadequate bathing of the stones, rocking beds were used. If treatment was ineffective after 2 weeks, heparin dosage was doubled. If there was no improvement after 4 weeks, mechanical retrieval was attempted with a ureteral stone basket. This was effective on stones under 1 cm in size. Only 5 of the 21 cases were unsuccessful. It is concluded that the use of heparin, cholic acid, and the ureteral stone basket are effective means of dealing with retained stones.

2288 CHOLESTEROL KINETICS IN PATIENTS WITH CHOLESTEROL GALLSTONES BEFORE AND DURING CHENODEOXYCHOLIC ACID TREATMENT. *(E.)* Pedersen, L.; Arnfred, T.; Thaysen, E. H. (North Aalborg Hosp., Denmark). *Scand. J. Gastroenterol.* 9(8):787-791, 1974.

The cholesterol kinetics in 4 patients with radiolucent gallstones was studied by an isotope dilution technique before and after 3 months treatment with 500 mg chenodeoxycholic acid (CDC) daily. None of the patients had any history of obstructive biliary disease, cholecystitis, diabetes mellitus, or liver disease. A single dose of about 30 μCi of 1-α,2-α-^{3}H-cholesterol was given i.v. and fasting plasma samples obtained at first twice, later once, weekly for about 10 weeks to determine cholesterol specific activity. The results were plotted against time and the decay curve analyzed in terms of a 2-pool model. On this basis, the size and turnover of the 2 exchangeable pools was estimated. The input into the rapidly miscible pool (A), which is assumed to approximate total cholesterol turnover, was calculated from these figures. Thereafter CDC was given for 3 months and the determination of cholesterol kinetics was repeated. The means of the rapidly miscible pool A, the more slowly miscible pool B, and the input into pool A were diminished by 19, 8, and 40%, resp., during treatment. Plasma cholesterol showed a slight tendency to increase and plasma triglyceride to decrease during treatment. The treatment did not cause any discomfort. None of the patients experienced diarrhea or biliary colic. Transient elevation of SGPT occurred in one patient, but SGOT, alkaline phosphatases, bilirubin, prothrombin time, whole blood count, and serum electrophoresis remained normal in all of them. The results suggest that CDC feeding in man suppresses cholesterol synthesis, and that it does not increase the total exchangeable cholesterol mass. It is suggested that CDC feeding affects cholesterol metabolism as follows. The increased intestinal concentration of bile acids inhibits intestinal cholesterol synthesis and increases the bile acid pool, which inhibits the transformation of cholesterol to bile acids.

2289 EFFECTS OF MEALS AND INTERRUPTION OF ENTEROHEPATIC CIRCULATION OF FLOW, LIPID COMPOSITION, AND CHOLESTEROL SATURATION OF BILE IN MAN AFTER CHOLECYSTECTOMY.

(E.) Soloway, R. D.; Schoenfield, L. J. (Mayo Clin., Rochester, Minn.). *Am. J. Dig. Dis.* 20(2):99-109, 1975.

In 4 patients (3 women and 1 man) studied after cholecystectomy and common duct exploration for cholesterol gallstones, bile salt and phospholipid output and bile flow increased 46%, 35%, and 40%, resp., in response to breakfast. Cholesterol output did not increase significantly. Simultaneously, cholesterol concentration decreased (mean, 12%) while phospholipid and bile salt concentrations did not change. The degree of cholesterol saturation of bile decreased in each study, whether or not the original ratio indicated cholesterol saturation; in 3 of 5 studies, an initially supersaturated bile became unsaturated with cholesterol in response to breakfast. No significant changes were noted after lunch. During interruption of enterohepatic circulation, studies with radiolabeled bile acids indicated that the increased bile acid output in response to meals was secondary to increased recirculation of intestinal bile acids rather than to *de novo* bile acid synthesis. This mechanism may account for the adequate delivery of bile salts and the decreased degree of cholesterol saturation of the bile postprandially in cholecystectomized patients.

2290 EFFECTS OF LOW DOSE CHENODEOXYCHOLIC ACID FEEDING ON BILIARY LIPID METABOLISM.

(E.) Adler, R. D.; Bennion, L. J.; Duane, W. C.; Grundy, S. M. (Phoenix Indian Med. Cent., Arizona). *Gastroenterology* 68(2):326-334, 1975.

The mechanism by which chenodeoxycholic acid reduces the relative bile cholesterol content was investigated and compared with the actions of cholic acid. Ten healthy subjects were given a diet containing 40% of its calories as lard. Five of the subjects were studied as inpatients for 3 months. The 1st month served as a control period and no bile acids were administered. During the 2nd month, some subjects were given a daily p.o. dose (500 mg) of either chenodeoxycholic acid or cholic acid, and during the 3rd, the 2 groups were crossed over. One subject stayed only 2 months and received only chenodeoxycholic acid, and the remaining 4 were treated as outpatients and also received only chenodeoxycholic acid. Two outpatients had dosages of 1500 and 250 mg/day, resp., and 1 inpatient was given 1000 mg cholic acid. Lithogenicity was determined from bile aspirated after an overnight fast and calculated as either molar % of cholesterol or lithogenic index. Biliary lipid secretion rates were determined by a marker dilution technique using ^{14}C-cholesterol. Bile acid pool size was measured by infusion of ^{14}C-cholic acid into the duodenum, and bile acid composition was determined by gas-liquid chromatography. It was found that lithogenicity was reduced in 9 subjects, the molar % of cholesterol was 24% lower after chenodeoxycholic feeding than control values, and the lithogenic indices showed a comparable decrease. Cholic acid had no significant effect. Secretion rates were 23% lower after chenodeoxycholic acid feeding than after cholic acid feeding or controls, and a slight decrease in bile acid pool size occurred after chenodeoxycholic acid feeding, although cholic acid caused a slight increase. Both acids produced significant increases in the proportion of the bile acid administered. It is concluded that bile lithogenicity is reduced even by low chenodeoxycholic acid doses, due to decreased cholesterol secretion, and without increased bile acid secretion or pool size.

2291 DIFFERENCES IN BILE ACID EXCRETION IN SUBJECTS WITH HYPERCHOLESTEROLAEMIA, HYPERTRIGLYCERIDAEMIA AND OVERWEIGHT.

(E.) Nestel, P. J.; Hunter, J. D. (John Curtin Sch. Med. Res., Australian Natl. Univ., Canberra). *Aust. NZ J. Med.* 4(5):491-496, 1974.

Bile acid excretion in 8 subjects with familial hypercholesterolemia and in 6 subjects with hypertriglyceridemia were compared with normal and overweight controls, resp. Diet was standardized in the hypercholesterolemic subjects and their controls. Blood was drawn from all subjects after a 14 hr fast and the plasma cholesterol and triglyceride concentrations measured. Feces were collected for bile acid content determination for a period of 8 days after 4 to 6 weeks of observation. Chromium oxide was taken by the subjects for 10 days preceding and throughout the fecal collection period as a marker to measure fecal transit time. It was found that bile acid excretion was significantly less in the hypercholesterolemic group (2.99 mg/kg/day) than in their controls (3.88 mg/kg/day). In the hypertriglyceridemic subjects bile acid excretion was significantly higher than any of the other 3 groups (6.07 mg/kg/day), while their overweight controls had the same excretion rate as the normal controls. It is concluded that familial hypercholesterolemia may represent diminished catabolism of cholesterol to bile acids, while hypertriglyceridemia exhibits increased cholesterol catabolism and turnover, which is independent of excess body weight.

2292 USE OF THE GALLBLADDER NECK IN THE RECONSTRUCTION OF THE BIFURCATION OF THE MAIN HEPATIC DUCTS.

(E.) Philippakis, M.; Apostolidis, N.; Androulakakis, P.; Doundoulakis, N.; Legakis, N. (Hippocration Gen. Hosp., Athens, Greece). *Am. Surg.* 41(2):103-105, 1975.

The gallbladder neck and the cystic duct were used in the reconstruction of the hepatic duct bifurcation in a 58 yr old man who presented with mild jaundice and intense pruritus. A tumor of the extrahepatic biliary tree was suspected, and a small adenocarcinoma was discovered upon surgery at the junction of the 2 main hepatic ducts. After excision of the tumor the infundibulum and body of the gallbladder were resected, and the neck anastomosed to the stump of the right hepatic duct. The stumps of the left and common hepatic ducts were then anastomosed. After 13 months there were no complications. It is suggested that this operation avoids the sequelae of cholangioenterostomy, and is therefore recommended for operations in this area when the gallbladder and cystic duct are in healthy condition.

2293 JEJUNAL MUCOSAL GRAFT: A SUTURELESS TECHNIC FOR REPAIR OF HIGH BILE DUCT STRICTURES. *(E.)* Wexler, M. J.; Smith, R. (St. George's Hosp., London, England). *Am. J. Surg.* 129(2):204-211, 1975.

The jejunal mucosal graft, a sutureless technique to solve the problems of biliary stricture repair, is described and evaluated. The technique uses the transhepatic tube principle along with a mucosal graft. The graft is formed by removing a seromuscular patch near the end of a Roux-en-Y loop of jejunum, creating a mucosal diverticulum. The biliary tree is entered at the porta hepatis and anchored to the Roux-en-Y loop through the diverticulum. The tube is then pulled back, carrying along the sleeve of jejunal mucosa to direct contact with the intrahepatic duct epithelium. Sixty-one repairs of this type were done in 50 patients, all of whom were referred after previous biliary tract operations. Morbidity was extremely low, the major complication being infection. Most of the postoperative assessments were made after over 18 months. It was found that 85% of the operations had an ultimately successful result with an operative mortality of 6%.

2294 AN UNUSUAL CASE OF PORTAL SYSTEMIC ENCEPHALOPATHY. *(E.)* Chowdhury, A. R.; Finestone, A. J. (Temple Univ. Hosp., Philadelphia, Pa.). *Am. J. Dig. Dis.* 20(2):176-181, 1975.

A 60-yr-old woman developed portal systemic encephalopathy of unknown etiology after the construction of a jejunoileal bypass for obesity. She had had 2 previous abdominal operations for small intestinal obstruction and incisional hernia 25 and 15 yr previously, resp. There were no esophageal varices or splenomegaly. Increase in dietary protein from 20 to 80 g/day caused blood ammonia level to rise from 121 to 253 μg/100 ml. The oral ammonia tolerance test also showed low tolerance. Selective celiac and superior mesenteric arteriography, and venous phase roentgenography demonstrated occlusion of the superior mesenteric and splenic veins with marked filling of the collateral circulation. It is suggested that this unusual complication of intestinal bypass may have been a result of previous abdominal surgery.

2295 ANTIBIOTICS IN BILIARY DISEASE. *(E.)* Keighley, M. R. B.; Drysdale, R.; Burdon, D. W.; Alexander-Williams, J. (Gen. Hosp., Birmingham, England). *Gut* 15(10):824, 1974.

2296 THE EFFECT OF FLORANTYRONE (ZANCHOL) ON THE COMPOSITION OF T-TUBE BILE. *(E.)* Kirkpatrick, J. R.; Eastwood, M. A.; Mitchell, W. D. (West. Gen. Hosp., Univ. Edinburgh, Scotland). *Gut* 15(10):824-825, 1974.

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2317 CHOLESTYRAMINE THERAPY IN CHOLESTATIC LIVER DISEASE OF CHILDREN. *(E.)* Nelson, R.; Murphy, G. M.; Edkins, S.; Nutter, S.; Anderson, C. M. (Inst. Child Health, Univ. Birmingham, England). *Gut* 15(10):825, 1974.

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2321 CARDIALGIA IN CALCULOUS CHOLECYSTITIS. *(Rus.)* Panfilov, B. K. (Med. Fac., Patrice Lumumba Peoples Friendship Univ., Moscow, USSR). *Klin. Med. (Mosk.)* 52(7):60-66, 1974.

See also, 1781, 1889, 1890, 1909, 1921, 1922, 2152, 2165, 2182, 2279.

GENERAL

2322 ISOLATION OF TWO MINIGASTRINS FROM ZOLLINGER-ELLISON TUMOUR TISSUE. *(E.)* Gregory, R. A.; Tracy, H. J. (Physiol. Lab., Univ. Liverpool, England). *Gut* 15(9):683-685, 1974.

A pair of gastrin tridecapeptides ("minigastrins") isolated from Zollinger-Ellison tumor tissue obtained at postmortem examination about 18 hr after death were examined. A partially purified aqueous extract of the tumor tissue (50 ml) was filtered through a column of Sephadex G-50 superfine grade 5 cm x 50 cm run at 4 C in 0.40 M ammonium bicarbonate solution saturated with toluene. Fractions of 5 ml were collected every 10 min and the UV absorption at 280 nm read in 2 mm cells. The fractions corresponding to the smallest molecular weight were chromatographed on an aminoethyl cellulose column. Quantitative amino acid determinations of the major fractions showed that both peptides had the same amino acid composition, that is, leucine, glutamic acid, alanine, tyrosine, glycine, tryptophan, methionine, aspartic acid, and phenylalanine. In 1 peptide, the tyrosine residue present was sulfated (type II); in the other (type I) it was not. The proportion of type I and II was approximately 2:1, similar to that for the gastrins and the heptadecapeptides isolated from the same source and from human antral mucosa. Both minigastrins were potent stimulants of gastric acid secretion when injected i.v. into conscious dogs provided with denervated pouches of the gastric fundus. Immunological evidence obtained in previous studies indicated that both minigastrins are present as circulating forms of the hormone gastrin in patients with the Zollinger-Ellison syndrome and in fed normal subjects. It is concluded that these peptides correspond to the fragment 5-17 of the heptadecapeptides isolated from the same source.

2323 AMINO TERMINAL GASTRIN FRAGMENT IN SERUM OF ZOLLINGER-ELLISON SYNDROME PATIENTS.

(E.) Dockray, G. W.; Walsh, J. H. (VA Wadsworth Hosp. Cent., Los Angeles, Calif.). *Gastroenterology* 68(2):222-230, 1975.

The molecular species of gastrin in the serum of 6 patients with Zollinger-Ellison syndrome were separated by gel filtration and ion exhange chromatography, and concentrations were estimated by radioimmunoassay using 2 antisera with different specificities. In addition to the previously described forms of gastrin, a new component was identified which was present in high concentrations and which has properties similar to the 1:13 fragment of G-17. Because of its pattern of immunoreactivity, it is assumed that this new component has an N-terminal portion closely resembling that of G-17. The new component was present in gastrinoma tumor tissue. Its concentration in serum of gastrinoma patients increases markedly when secretin is injected. Since its component was identified in tumor extracts, and since its concentration rapidly increases in serum after secretin, it seems likely that this molecule is stored by the tumor together with G-17 and G-34. The fragment may be synthesized in its own right, or it may be produced from the breakdown of G-17 and G-34 within the synthesizing cell. The finding of this new component and the possibility that it may be the 1:13 fragment of G-17, indicates the desirability of a search for gastrin tetrapeptide.

2324 CALCIUM AND SECRETIN-STIMULATED GASTRIN RELEASE IN THE ZOLLINGER-ELLISON SYNDROME.

(E.) Kolts, B. E.; Herbst, C. A.; McGuigan, J. E. (Univ. Florida Coll. Med., Gainesville). *Ann. Intern. Med.* 81(6):758-762, 1974.

Serum gastrin and calcium concentrations were measured and compared before and after calcium and secretin infusions in 3 patients (all women, aged 45-58 yr) with the Zollinger-Ellison syndrome and 3 control subjects. Each person was given a constant 3 hr i.v. infusion of calcium gluconate (5 mg Ca/kg/hr) in 0.9% sodium choloride. Secretin was given to 2 patients at a rate of 9 U/kg, i.v., for 1 hr. In the 3rd patient secretin was infused for 1 min at 1 U/kg, i.v. Calcium infusion induced marked increases in serum gastrin concentrations in the Zollinger-Ellison patients (increases 3100 to 19,000 pg/ml) and modest increases in the control subjects, mean increase of 29 pg/ml. In each patient receiving calcium infusion, there was significant positive correlation between serum gastrin and calcium levels. Secretin also increased serum gastrin levels, ranging from 800 to 11,000 pg/ml, with the most marked increases observed in the 2 patients receiving the larger dose of secretin. However, there was not a positive correlation between serum gastrin and calcium. These studies affirm secretin-induced paradoxical augmentation of serum gastrin in patients with Zollinger-Ellison syndrome. Failure to show positive correlation between serum gastrin and calcium with secretin administration, as is readily demonstrable with calcium infusion, provides no support for serum calcium increases as the mechanism by which serum gastrin is increased after secretin infusion in patients with Zollinger-Ellison syndrome.

2325 JEJUNAL MICROFLORA IN MALNOURISHED GAMBIAN CHILDREN.

(E.) Heyworth, B. Brown, J. (Med. Res. Counc. Lab., Fajara, Gambia). *Arch. Dis. Child.* 50(1):27-33, 1975.

To investigate the presence of bacterial overgrowth, jejunal intubation was carried out in 25 cases of malnutrition (15 boys and 10 girls, aged 9-34 months). Growth of bacteria greater than 10^5 organisms/ml was found in 22 children, 17 of whom had a history of chronic diarrhea. The remaining 8 children either had no diarrhea or were having an acute attack lasting several days. In the children with chronic diarrhea, *Escherichia coli*, bacteroides, and enterococci occurred more frequently, while streptococci occurred more frequently in those with acute diarrhea. Bacilli, staphylococci, micrococci, *Klebsiella*, pseudomonads, and *Candida* often occurred in both groups, but in larger numbers in those with chronic diarrhea. These findings support the theory that children with malnutrition have considerable bacterial contamination of the jejunum, and that this may be of etiological significance for much of the diarrhea seen in malnourished children. It is suggested that this bacterial contamination may also be important in the pathogenesis of malnutrition. The presence of intestinal parasites in these malnourished children is also noted. Although the effectiveness of antibiotics has a limited time span, those children who had high counts of bacteroides improved dramatically when the correct antibiotic was given. This would be of some help in areas where protein-calorie malnutrition appears to be seasonal. It may be that removing the child to a more sanitary environment could constitute correct treatment, permitting natural clearance of organisms from the jejunum. It was noted that even those with chronic diarrhea who were not given broad-spectrum antibiotics underwent an improvement in the diarrhea and gained weight while in the hospital.

2326 IMMUNOLOGIC RESPONSES IN MALNOURISHED CHILDREN.

(E.) Neumann, C. G.; Lawlor, Jr., G. J.; Stiehm, E. R.; Swendseid, M. E.; Newton, C.; Herbert, J.; Ammann, A. J.; Jacob, M. (Univ. California Sch. Med., Los Angeles). *Am. J. Clin. Nutr.* 28(2):89-104, 1975.

Humoral and cellular immune function was studied in 76 malnourished Ghanian children (aged 6 months - 6 yr) and 41 controls. Subjects with protein-calorie malnutrition were divided into groups of severely malnourished (34) and moderately malnourished (42) subjects based on anthropometry, overt signs of kwashiorkor or marasmus, and serum albumin. Serum immunoglobulins (IgG, M, A, D, and E), antibody response to keyhole limpet hemocyanin and polyvalent pneumococcal polysaccharide and cutaneous delayed hypersensitivity response to monilia, streptokinase-streptodornase and phytohemagglutinin were determined. Also, *in vitro* lymphocyte responses to several dilutions of phytohemagglutinin were determined in 27 severely malnourished children, 14 moderately malnourished children, and 10 controls. Increased immunoglobulin levels were found in all 3 groups with the levels somewhat higher in the malnourished groups. The marked elevation of IgE levels in the severely malnourished group may reflect intestinal parasitism or disordered T-cell function. Antibody responses were equal in all 3 groups. Cutaneous delayed hypersensitivity was decreased in both of the malnourished groups. The lymphocytes of 5 of the 27 severely malnourished children gave an abnormally reduced *in vitro* response to phytohemagglutinin. All controls and moderately malnourished children responded normally; however, the maximal level of response was higher in controls. The principle finding of the study was that the diminished cellular immune function in protein-calorie malnutrition was in proportion to the severity of the malnutrition, with little or no impairment of humoral immunity. The increased number of infections likely to occur in malnourished children may perpetuate a vicious cycle of further malnutrition not only through reduction of food intake but through the negative nitrogen balance produced by the catabolic effect of measles and other infections. The infections may in themselves depress cell-mediated immunity, thus allowing new infections to emerge or existing ones to become more severe. The use of simple tests or observations such as absent cutaneous delayed hypersensitivity, total lymphocyte counts under 1,000 cell/mm^3, decreased tonsillar size or absence of tonsils and marked reduction in anthropometric measurements for age should alert the clinician to the possible existence of a cellular immune defect with increased vulnerability to infection.

2327 GASTROINTESTINAL PROTEIN LOSS IN RHEUMATOID ARTHRITIS, STUDIED WITH ^{51}CR-CHROMIC CHLORIDE AND ^{125}I ALBUMIN.

(E.) Plantin, L. O.; Strandberg, O. (King Gustaf V Res. Inst., Stockholm, Sweden). *Scand. J. Rheumatol.* 3(4):169-173, 1974.

Gastrointestinal excretion was studied during 7 days of ^{51}Cr-activity following the i.v. administration of ^{51}Cr-chromium chloride in 12 patients (10 women and 2 men aged 22-72 yr) with rheumatoid arthritis and 16 healthy controls (12 women and 4 men aged 20-51 yr). Most of the patients were simultaneously studied with respect to albumin pools and catabolism by ^{125}I-labeled albumin. In the control subjects, the mean serum albumin concentration was 5.1 g/100 ml and the mean intravascular pool was 2.46 g/kg. The mean fractional catabolism of iodinated albumin was 7.8% of the intravascular pool. In these subjects this represented an albumin catabolism of 0.19 g albumin/24 hr/kg. The mean extravascular/intravascular pool quotient was 1.6. The mean extravascular pool was 172 g. The mean ^{51}Cr excretion during 7 days was 0.7% of the dose. In the rheumatoid arthritis patients, the serum albumin concentration was subnormal as was the intravascular albumin pool. Thus an albumin deficit was well established. The mean fractional catabolic rate of ^{125}I-albumin, 10.0% of the intravascular pool, was not significantly elevated. A comparison of the mean quantitative catabolism between the arthritis and control groups showed no statistical difference. One of the patients had a secondary amyloidosis and combined mitral rheumatic heart disease in addition to rheumatoid arthritis. She had considerable renal protein losses, a relatively and absolutely elevated albumin catabolism, and a reduced intravascular albumin pool. The extravascular/intravascular quotient was significantly higher in the arthritis group than in controls. The mean fecal ^{51}Cr loss during the 7 days was significantly higher in the arthritis group, 1.7% of the dose. The low normal chromium excretion makes it possible to assess even small elevations of the gastrointestinal protein loss. The small gastrointestinal protein loss could be a symptom of early amyloid vascular lesion in patients with long-standing rheumatoid arthritis. I.v. injection of ^{57}Cr-chromium chloride is a comparatively convenient method for the diagnosis and quantitation of gastrointestinal protein loss.

2328 PATHOPHYSIOLOGY OF SHIGELLA DIARRHEA IN THE RHESUS MONKEY: INTESTINAL TRANSPORT, MORPHOLOGICAL, AND BACTERIOLOGICAL STUDIES.

(E.) Rout, W. R.; Formal, S. B.; Giannella, R. A.; Dammin, G. J. (Univ. Kentucky Coll. Med., Lexington). *Gastroenterology* 68(2):270-278, 1975.

Jejunal, ileal, and colonic water and electrolyte transport was studied in *Shigella flexneri* 2a-infected monkeys. Infected animals were divided into 3 groups: dysentery alone, diarrhea alone, or diarrhea and dysentery together. In controls, net water, sodium, and chloride absorption was seen in the jejunum, ileum, and colon. All infected animals demonstrated diminished colonic absorption or net colonic secretion. In monkeys with dysentery alone, colonic dysfunction was the only transport defect observed. In contrast, animals with diarrhea either alone or combined with dysentery, exhibited net jejunal secretion, although ileal transport was little affected. A severe colitis with intramucosal shigellae was observed in all symptomatic animals. In the jejunum or ileum, however, morphological changes were minimal and bacterial invasion was not seen. Therefore, unlike the "toxigenic diarrheas", shigellosis is both a small and large intestinal disease. Mucosal invasion of the colon is essential to the development of a morphological and transport defect. Dysentery results from a colonic transport defect, while diarrhea is secondary to jejunal secretion superimposed on the defect in colonic absorption.

2329 IMPORTANCE OF A NEW VIRUS IN ACUTE SPORADIC ENTERITIS IN CHILDREN.

(E.) Davidson, G. P.; Bishop, R. F.; Townley, R. R. W.; Holmes, I. H.; Ruck, B. J. (R. Child. Hosp., Melbourne, Australia). *Lancet* 1(7901):242-245, 1975.

In a year-long survey of acute enteritis in children, a total of 378 patients were studied (209 males and 169 females, aged 10 days to 12 1/2 yr). An etiological agent was found in approximately 75% of the cases: a newly described virus belonging to the family *Reoviridae*, duovirus, was seen in children with acute enteritis but not in control children. Mixed infections of duovirus with adenovirus (10), enterovirus (7), "enteropathogenic" *E. coli* (4), or *Salmonella* species (3) were seen in 24 of the children. Acute enteritis was most common during the winter months. Duoviruses were the most common enteric pathogens during all but the 2 hottest months of the year. Duovirus infection peaked during early winter, occurring in 73% of the patients. Duovirus infection was a common cause of enteritis in each age group up to 5 yr of age. The highest percentage of infections (66%) occurred in the 6-12-month-old group. The youngest child from whom duovirus particles were recovered was 10 days old. The duration of infection was brief, with a probable incubation period of less than 2 days. No duovirus particles were seen in feces from any of 16 patients so tested after 8 days from onset of symptoms. Infections acquired in the hospital were not uncommon. Of the 25 children who developed symptoms of acute enteritis while in the hospital for another illness, 22 showed duovirus particles in stool extracts. There were 4 fatal cases of enteritis in this study. The name "duovirus" is proposed for this new virus, as opposed to "rotavirus" as has previously been suggested. It is suggested that this new virus will prove to be the most important etiological agent of sporadic acute enteritis in young children.

2330 NECROTIZING ENTEROCOLITIS.

(E.) Frantz, III, I. D.; L'Heureux, P.; Engel, R. R.; Hunt, C. E. (Dep. Pediatr., Univ. Minnesota, Minneapolis). *J. Pediatr.* 86(2):259-263, 1975.

The diagnosis, management and clinical course of necrotizing enterocolitis was studied during a 39 month period, in 54 cases of necrotizing enterocolitis developed in a neonatal intensive care unit, which represents an incidence of 4.7% of all neonatal admissions. Of these 54 cases, 49 (91%) were premature, representing an incidence of 7.3% of all premature infants admitted during this time period. The other 5 patients included 1 infant following corrective surgery for complete transposition of the great vessels, 1 with severe respiratory distress syndrome, 1 with severe birth asphyxia, and 2 with congenital heart disease. Age at onset ranged from 1-22 days, mean 6.5 days. Roentgenographic findings showed all but 5 patients had pneumatosis intestinalis. Gas in the portal venous system occurred in 8, 2 of whom survived surgery. Pneumoperitoneum secondary to intestinal perforation occurred in 5 patients, 2 of whom survived. Of the 54 patients, 51 were evaluated for disseminated intravascular coagulation and 26 showed positive results. Surgical treatment was performed on any patient if one or more of the following were present at diagnosis: intestinal perforation, metabolic acidosis and/or shock, or disseminated intravascular coagulation. The 16 patients managed medically received continuous nasogastric decompression for at least 10 days, parenteral antibiotic therapy of gentamicin and penicillin, and i.v. alimentation until enteric feedings were reinstituted after 10 days. Of these 16, 7 (44%) survived. Of the 38 treated surgically, 12 (31%) survived. The clinical course of the 54 patients was compared to a matched group of 98 control patients. On the day of life that necrotizing enterocolitis occurred, all 54 patients and 63% of the controls were receiving standard formula feedings, both at 80 cal/kg/day. Stool cultures at that time revealed a significantly increased frequency of *Klebsiella* in necrotizing enterocolitis patients as compared to contols. It is suggested that the combined presence of certain intestinal bacteria and enteric feedings, perhaps requiring a background of mucosal ischemia, may be of etiological significance in the development of necrotizing enterocolitis and pneumatosis intestinalis.

2331 INTRAARTERIAL VASOPRESSIN IN THE TREATMENT OF UPPER GASTROINTESTINAL HEMORRHAGE: A PROSPECTIVE, CONTROLLED CLINICAL TRIAL.

(E.) Conn, H. O.; Ramsby, G. R.; Storer, E. H.; Mutchnick, M. G.; Joshi, P. H.; Phillips, M. M.; Cohen, G. A.; Fields, G. N.; Petroski, D. (VA Hosp., West Haven, Conn.). *Gastroenterology* 68(2):211-221, 1975.

A trial was undertaken to compare conventional treatment of massive upper gastrointestinal hemorrhage with conventional therapy plus intraarterial vasopressin. Sixty episodes of upper gastrointestinal hemorrhage were evaluated in 53 patients (51 men and 2 women, aged 24-83 yr). Conventional treatment was used in 32 episodes and vasopressin was added in 28. Cirrhosis was present in 34 patients (64%). Bleeding occurred twice in 7 of the cirrhotic patients. Bleeding originated from esophageal or gastric varices in 33 episodes (55%). Vasopressin (1 U/ml) was administered at an initial rate of 0.05 to 0.20 U/min. The dose was increased until bleeding decreased. Subsequent dosage of vasopressin did not exceed 0.4 U/min. Duration of vasopressin therapy ranged from 7-74 hr (mean 28); conventional treatment, 3-64 hr (mean 22). In 9 of the conventionally treated patients (28%) and in 20 of those receiving vasopressin (71%), the hemorrhages were successfully controlled. Based on cessation of hemorrhage for at least 5 days, conventional therapy was successful in only 16% and vasopressin in only 26% of the patients. In cases of nonvariceal hemorrhage, conventional therapy was successful in

5 of 16 episodes (31%) and vasopressin in 8 of 11 (73%). For variceal hemorrhage, 4 of 16 treated conventionally (25%) and 12 of 17 receiving vasopressin (71%) had the bleeding controlled. Vasopressin therapy caused a reduction in transfusion requirements from 7.1 U/patient before to 3.7 U/patient after therapy was started. Such a drop was not noted with conventional therapy. Of the 32 conventionally treated episodes, 18 ended fatally (56%) compared to 15 of 28 treated with vasopressin (54%). There was no significant effect of either form of therapy on survival of cirrhotic versus noncirrhotic patients; or on survival of those bleeding from nonvariceal sites or from varices. Of 20 patients in whom conventional therapy failed, 10 were successfully treated with vasopressin and, of these 10, 7 survived. Complications occurred in only 3 patients treated conventionally, all had arrhythmias, 2 of whom had hypertension and bradycardia and the other had atrial fibrillation. The vasopressin group shared 18 complications among 12 patients, which included hypertension, bradycardia, other arrhythmias, cardiac arrest, respiratory arrest, and technical vascular complications. It is suggested that, if bleeding can be stopped with vasopressin, elective surgery can be performed whenever appropriate; if not, even transient control may delay action until surgery can be performed on a semi-elective basis, rather than as an emergency.

2332 IMMUNOCHEMICAL CONFIRMATION OF GASTROINTESTINAL BLEEDING. *(E.)* Adams, E. C.; Layman, K. M. (Ames Res. Lab., Elkhart, Ind.). *Ann. Clin. Lab. Sci.* 4(5):343-349, 1974.

Hemoglobin was detected by hemagglutination inhibition and by direct slide latex agglutination in fecal extracts from subjects who had gastrointestinal bleeding or who had ingested their own blood (10-20 ml as liquid or lyophilized blood in gelatin capsules). By using the direct slide agglutination test with human hemoglobin and erythrocyte stroma antigens, it was possible to determine the approximate site of bleeding. Fecal extracts from patients with bleeding from the duodenum or above were positive for hemoglobin but not stroma, while those from patients with bleeding from the lower part of the colon were positive for both hemoglobin and stroma. Fecal extracts from patients who ingested their own blood became positive for hemoglobin 10 hr after ingestion and remained positive for several days. The stroma test was negative after ingestion of blood by either means. Neither of the tests for human hemoglobin nor the test for stroma was positive on fecal extracts from subjects on a meat diet, although the peroxidase test was strongly positive.

2333 THE EFFECT OF CHOLESTYRAMINE ON THE ELIMINATION OF CHOLESTEROL AS BILE ACIDS IN PATIENTS WITH HYPERLIPOPROTEINAEMIA TYPE II and IV. *(E.)* Einarsson, K.; Hellstrom, K.; Kallner, M. (Serafim Hosp., Stockholm, Sweden). *Eur. J. Clin. Invest.* 4(6):405-410, 1974.

The turnover of ^{14}C-cholic acid and ^{3}H-chenodeoxycholic acid was studied in 10 hyperlipemic patients (5 men and 5 women, aged 45-61 yr) before and during treatment with cholestyramine (10-12 g/day). In the 5 female patients with hyperlipoproteinemia type IIa the pool size prior to treatment averaged 320 mg and the turnover of cholic acid averaged 96 mg/day. Corresponding values for chenodeoxycholic acid were 728 mg and 168 mg/day. During cholestyramine treatment, cholic acid snythesis rose 4 to 18-fold and the turnover of chenodeoxycholic acid increased to a mean of 379 mg/day. Combined pool size of cholic acid and chenodeoxycholic acid averaged 1048 mg before and 1389 mg during treatment with cholestyramine. Values for total bile acid formation were 264 and 1116 mg/day, resp. In 3 of the patients, the changes due to therapy were associated with a normalization of the serum cholesterol levels. Due primarily to the high turnover of cholic acid, total bile acid synthesis was above normal in the 5 male patients with hyperlipoproteinemia type IV. During cholestyramine treatment, the serum lipids and cholic acid formation were unchanged, but the turnover of chenodeoxycholic acid increased by a factor of 2. This caused a decrease of the abnormally high initial ratio between the formation of cholic acid and chenodeoxycholic acid from 3.3 to 1.5. The unequal response to cholestyramine treatment is taken to be a further indication that hyperlipoproteinemia type II and type IV are different entities of disease affecting cholesterol and bile acid metabolism. It is not certain at this time whether the characteristic pattern encountered for bile acid formation in patients with hyperlipoproteinemia types II and IV is due to differences in the catabolic pathways of cholesterol.

2334 EOSINOPHILIC INFILTRATION OF DUODENUM AND PANCREATIC HEAD: REPORT OF A CASE STUDIED ARTERIOGRAPHICALLY. *(E.)* Ryan, K. G. (Woodland Clin. Med. Group, Calif.). *Surgery* 77(2):321-324, 1975.

A 39 yr old man presented with a 2 week history of right upper quandrant abdominal pain, nausea, vomiting, and intermittent chills and fever. An i.v. cholangiogram was normal. All other studies were negative except for a slightly elevated serum alkaline phosphatase. Six months later the pain returned in the epigastrium and right upper quadrant followed by 2 or 3 episodes of bright red blood in the stools. A lesion involving the second portion of the duodenum was thought to be carcinoma of the head of the pancreas. One month later a barium study of the duodenum showed a segment in the descending duodenum which remained persistently narrow with a predominant impression on the lateral aspect, interpreted as a lesion either intrinsic to the duodenum or circumferential about the duodenum. Pancreatic arteriography was carried out with selective celiac axis and superior mesenteric artery catheterization. Due to the absence of arteriographic abnormality and the appearance on the duodenogram, the radiological diagnosis favored a benign intrinsic duodenal lesion, such as scarring from peptic ulcer or regional enteritis, with the possibility that this could represent annular pancreas. Surgery revealed a mass involving the head of the pancreas and duodenum, diagnosed surgically as carcinoma of the head of the pancreas, and radical pancreatoduodenectomy, cholecystectomy, antrectomy, and vagotomy were carried out. Pathological examination showed no evidence of malignancy or of parasitic infestation. Pathological diagnosis was eosinophilic duodenitis and pancreatitis with inflammatory pseudotumor. Few reports of this disease show lesions confined to the duodenum. It is also uncommon to see involvement of adjacent organs other than regional lymph nodes. It is noted that the entirely normal angiographic findings would be very unusual if the mass demonstrated on the barium studies were indeed carcinoma. A normal vascular pattern arteriographically demonstrated in the mass is suggested as a preoperative clue to a benign diagnosis which should raise the possibility of eosinophilic granuloma. Conservative management is recommended for this disease.

2335 PAROTID LYMPHANGIOMA: A CONGENITAL TUMOUR. *(E.)* Kornblut, A. D.; Ilse, H.; Haubrich, J. (HNO Clin., Univ. Gottingen, Germany). *Otorinolaringol. Oftalmol.* 35(5):303-314, 1973.

2336 CYSTIC ADENOMA OF A MINOR SALIVARY GLAND: A HISTOCHEMICAL STUDY. *(E.)* Harrison, J. D. (King's Coll. Hosp. Dent. Sch., London, England). *J. Pathol.* 114(1):29-38, 1974.

2337 LIGHT CHAIN TYPE RATION OF IgA-PRODUCING CELLS IN HUMAN JEJUNAL BIOPSIES. *(E.)* Mul, N. A. J.; de Boer, L. E. M.; Taminiau, J. A.; Ballieux, R. E. (Univ. Hosp., Utrecht, Netherlands). *Eur. J. Clin. Invest.* 5(1):63-67, 1975.

2338 LYMPHOGENIC ENTEROPATHY FROM THORACIC DUCT OBSTRUCTION. *(E.)* Molnar, Z.; Karoliny, G.; Mozsik, G.; Nemeth, A. (Univ. Med. Sch., Pecs, Hungary). *Lymphology* 7(3):130-136, 1974.

2339 ANTIBIOTICS AND FAECAL TRYPTIC ACTIVITY. *(E.)* Morrison, P. S.; Barnes, G. L. (St. Bartholemew's Hosp., London, England). *NZ Med. J.* 80(530):544-545, 1974.

2340 BEHAVIORAL EFFECTS OF DIETARY GALACTOSE IN GALACTOSEMIA HETEROZYGOTES. *(E.)* Frazier, P. D. M.; Frazier, J. R.; Summer, G. K. (Univ. North Carolina Sch. Med., Chapel Hill). *Fed. Proc.* 34(3):930, 1975.

2341 IMPAIRMENT OF UPPER ALIMENTARY VAGAL FUNCTION IN DIABETES. *(E.)* Stewart, I. M.; Hosking, D. J.; Preston, B. J. Atkinson, M. (Nottingham Gen. Hosp., England). *Gut* 15(10):832, 1974.

2342 DEFICIENCY OF LIPOLYTIC PANCREATIC ENZYMES IN AN ADULT MAN. *(E.)* Arnesjo, B.; Ihse, I.; Odeberg, H.; Stahl, E. (Univ. Hosp. Lund, Sweden). *Digestion* 11(1/2):147-151, 1974.

2343 SURGICAL LAPAROSCOPY. *(Rus.)* Prudkov, I. D. (Sverdlovsk Med. Inst., USSR). *Klin. Khir.* (9):56-60, 1974.

2344 THE SECRETIN PROVOCATION TEST IN THE DIAGNOSIS OF ZOLLINGER-ELLISON SYNDROME. *(E.)* Bonfils, S.; Mignon, M.; Accary, J. P. (INSERM, Bichat Hosp., Paris, France). *Gut* 15(10):841, 1974.

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2346 EFFECT OF UROGASTRONE IN THE ZOLLINGER-ELLISON SYNDROME. *(E.)* Elder, J. B.; Ganguli, P. C.; Gillespie, I. E.; Delamore, I.; Gregory, H. (R. Infirm., Manchester, England). *Gut* 15(10):840, 1974.

2347 ABDOMINAL PREGNANCY AS A CAUSE OF FRANK MELENA. *(E.)* Machudo, A. L.; de Menezes, D. B.; Rabelo, J. I. C. (Gen. Hosp., Fortaleza, Brazil). *Arq. Gastroenterol.* 11(4):237-240, 1974.

2348 PROTEIN-CALORIE MALNUTRITION IN INFANT NON-HUMAN PRIMATES: CORRELATION OF BIOCHEMICAL AND ULTRASTRUCTURAL ALTERATIONS IN THE LIVER. *(E.)* Worthington, B. S.; Enwonwu, C. O. (no affil.). *Fed. Proc.* 34(3):941, 1975.

2349 ASSESSMENT OF STEATORRHOEA IN MALNOURISHED CHILDREN. *(E.)* Gracey, M.; Thomas, J.; Suharjono; Hendardji, H. (Princess Margaret Child. Med. Res. Found., Perth, Australia). *Environ. Child Health* 20(5):223-225, 1974.

2350 PLATELET AND FIBRINOGEN SURVIVAL IN KALA-AZAR. *(E.)* Musumeci, S.; D'Agata, A.; Panebianco, M. G. (Dep. Pediatr., Univ. Catania, Italy). *Trans. R. Soc. Trop. Med. Hyg.* 68(5):360-367, 1974.

2351 CHARACTERIZATION OF VIBRIOS, ISOLATED AT VELLORE, AND CORRELATION WITH EPIDEMIOLOGIC PATTERNS OF CHOLERA. *(E.)* Koshi, G.; Brahmadathan, K. N. (Christ. Med. Coll. Hosp., Vellore, India). *Indian J. Med. Res.* 61(12):1730-1736, 1973.

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2355 ASSOCIATION OF Salmonella typhimurium WITH, AND ITS INVASION OF, THE ILEAL MUCOSA IN MICE. *(E.)* Tannock, G. W.; Blumershine, R. V. H.; Savage, D. C. (Dep. Microbiol., Univ. Illinois, Urbana). *Infect. Immun.* 11(2):365-371, 1975.

2356 DISACCHARIDE HYDROLYSIS, INTESTINAL ABSORPTION AND ELECTROGENIC PROPERTIES IN Salmonella ENTEROCOLITIS IN MICE. *(E.)* Madge, D. S. (Dep. Biol. Sci., Wye Coll., England). *Digestion* 11(1/2):25-38, 1974.

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2358 COMPARATIVE STUDY OF EPIDEMIOLOGICAL FEATURES AND THE CLINICAL COURSE OF ENTERITIS CAUSED BY ENTEROPATHOGENIC Escherichia coli 0124 AND CRIMEA. *(Rus.)* Milovanova, L. P.; Bondarenko, V. I.; Kubasov, I. G.; Bellavina, G. S.; Gallinskaia, S. M.; Gertsryken, S. L. (Kiev Inst. Epidemiol. Microbiol. Parasitol., USSR). *Zh. Mikrobiol. Epidemiol. Immunobiol.* (6):75-78, 1974.

2359 SELECTION RATE OF DRUG-RESISTANT FORMS OF Escherichia AS A FUNCTION OF THE ANTIBIOTICS USED TO TREAT PATIENTS WITH ACUTE DYSENTERY. *(Rus.)* Astapov, A. A.; Amvrosiev, Iu. A.; Tsynkalovskii, I. B. (Kuban Med. Inst., Stavropol, USSR). *Antibiotiki* 19(3):279, 1974.

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2364 SHIGA BACILLUS DYSENTERY ASSOCIATED WITH MARKED LEUKOCYTOSIS AND ERYTHROCYTE FRAGMENTATION. *(E.)* Mujibur Rahaman, M.; Jamiul Alam, A. K. M.; Islam, M. R.; Greenough III, W. B.; Lindenbaum, J. (Cholera Res. Lab., Dacca, Bangladesh). *Johns Hopkins Med. J.* 36(2):65-70, 1975.

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2366 SMALL INTESTINAL MUCOSAL MORPHOLOGY IN A GROUP OF INFANTS AND YOUNG CHILDREN WITH DELAYED RECOVERY AFTER ACUTE DIARRHOEA AND VOMITING. *(E.)* Boyce, M. J.; France, N. E.; Walker-Smith, J. A. (no affil.). *Gut* 15(10):827, 1974.

2367 LOPERAMIDE (R 18 553), A NOVEL TYPE OF ANTIDIARRHEAL AGENT. PART 1: IN VIVO ORAL PHARMACOLOGY AND ACUTE TOXICITY. COMPARISON WITH MORPHINE, CODEINE, DIPHENOXYLATE AND DIFENOXINE. *(E.)* Niemegeers, C. J. E.; Lenaerts, F. M.; Janssen, P. A. J. (Res. Lab., Janssen Pharm., Beerse, Belgium). *Arzneim. Forsch.* 24(10):1633-1666, 1974.

2368 LOPERAMIDE (R 18 553), A NOVEL TYPE OF ANTIDIARRHEAL AGENT. PART 2: IN VIVO PARENTERAL PHARMACOLOGY AND ACUTE TOXICITY IN MICE. COMPARISON WITH MORPHINE, CODEINE AND DIPHENOXYLATE. *(E.)* Niemegeers, C. J. E.; Lenaerts, F. M.; Janssen, P. A. J. (Res. Lab., Janssen Pharm., Beerse, Belgium). *Arzneim. Forsch.* 24(10):1636-1640, 1974.

2369 LOPERAMIDE (R 18 553), A NOVEL TYPE OF ANTIDIARRHEAL AGENT. PART 3: IN VITRO STUDIES ON THE PERISTALTIC REFLEX AND OTHER EXPERIMENTS ON ISOLATED TISSUES. *(E.)* Van Nueten, J. M.; Janssen, P. A. J.; Fontaine, J. (Res. Lab., Janssen Pharm., Beerse, Belgium). *Arzneim. Forsch.* 24(10):1641-1645, 1974.

2370 LOPERAMIDE (R 18 553), A NOVEL TYPE OF ANTIDIARRHEAL AGENT. PART 4: STUDIES ON SUBACUTE AND CHRONIC TOXICITY AND THE EFFECT ON REPRODUCTIVE PROCESSES IN RATS, DOGS AND RABBITS. *(E.)* Marsboom, R.; Herin, V.; Verstraeten, A.; Vandesteene, R.; Fransen, J. (Res. Lab., Janssen Pharm., Beerse, Belgium). *Arzneim. Forsch.* 24(10):1645-1649, 1974.

2371 LOPERAMIDE (R 18 553), A NOVEL TYPE OF ANTIDIARRHEAL AGENT. PART 5: THE PHARMACOKINETICS OF LOPERAMIDE IN RATS AND MAN. *(E.)* Heykants, J.; Michiels, M.; Knaeps, A.; Brugmans, J. (Dep. Drug Metab., Janssen Pharm., Beerse, Belgium). *Arzneim. Forsch.* 24(10):1649-1653, 1974.

2372 LOPERAMIDE (R18 553), A NOVEL TYPE OF ANTIDIARRHEAL AGENT. PART 6: CLINICAL PHARMACOLOGY. PLACEBO-CONTROLLED COMPARISON OF THE CONSTIPATING ACTIVITY AND SAFETY OF LOPERAMIDE, DIPHENOXYLATE AND CODEINE IN NORMAL VOLUNTEERS. *(E.)* Schuermans, V.; Van Lommel, R.; Dom, J.; Brugmans, J. (Res. Lab., Janssen Pharm., Beerse, Belgium). *Arzneim. Forsch.* 24(10):1653-1657, 1974.

2373 LOPERAMIDE (R 18 553), A NOVEL TYPE OF ANTIDIARRHEAL AGENT. PART 7: CLINICAL INVESTIGATION. EFFICACY AND SAFETY OF LOPERAMIDE IN PATIENTS WITH SEVERE CHRONIC DIARRHEA. *(E.)* Verhaegen, H.; De Cree, J.; Schuermans, V. (St. Bartholomeus Hosp., Merksem-Antwerp, Belgium). *Arzneim. Forsch.* 24(10):1657-1660, 1974.

2374 LOPERAMIDE (R 18 553), A NOVEL TYPE OF ANTIDIARRHEAL AGENT. PART 8: CLINICAL INVESTIGATION. USE OF A FLEXIBLE DOSAGE SCHEDULE IN A DOUBLE-BLIND COMPARISON OF LOPERAMIDE WITH DIPHENOXYLATE IN 614 PATIENTS SUFFERING FROM ACUTE DIARRHEA. *(E.)* Dom, J.; Leyman, R.; Schuermans, V.; Brugmans, J. (Dep. Clin. Res., Janssen Pharm., Beerse, Belgium). *Arzneim. Forsch.* 24(10):1660-1665, 1974.

2375 A MULTICENTRE DOUBLE-BLIND STUDY IN ACUTE DIARRHOEA COMPARING LOPERAMIDE (R 18 553) WITH TWO COMMON ANTIDIARRHOEAL AGENTS AND A PLACEBO. *(E.)* Amery, W.; Duyck, F.; Polak, J.; Ven Den Bouwhuysen, G. (Res. Lab., Janssen Pharm., Beerse, Belgium). *Curr. Ther. Res.* 17(3):263-270, 1975.

See also, 1598, 1727, 1846, 2013, 2051, 2074, 2379.

GENERAL

Parasitology

2376 SERUM IgE LEVELS IN PROTOZOAL AND HELMINTHIC INFECTIONS. *(E.)* Radermecker, M.; Bekhti, A.; Poncelet, E.; Salmon, J. (Hosp. Baviere, Univ. Liege, Belgium). *Int. Arch. Allergy Appl. Immunol.* 47(2):285-295, 1974.

Serum IgE concentration was measured according to the Rowe modification of the Mancini technique in non-atrophic patients suffering from various helminthic or protozoal infections. Normal serum IgE levels ranged from 100-370 U/ml. An increment of IgE levels above the 95% confidence limits was noted in 67% of the 40 patients with systemic parasitosis and in 37% of 8 patients with protozoal infections. All but one of 23 patients with intestinal parasitosis had normal serum IgE concentration. High serum IgE levels were regularly found in schistosomiasis, strongyloidiasis, echinococciasis, filariasis and hookworm disease. All 17 patients with threadworms or tapeworms had normal IgE levels. In 6 patients, the serum IgE levels were followed periodically before and after specific treatment of the parasitosis. In 2 cases of schistosomiasis, after niridazole administration (25 mg/kg for 7 days) the IgE values rose sharply immediately following onset of therapy. The values decreased slowly. Similar results were noted in 1 of 2 patients receiving thiabendazole (25 mg/kg for 1 day) for strongyloidiasis. These results suggest that the capacity of helminthic antigens to potentiate IgE synthesis is related to the parasite's ability to migrate into host tissues. These data also show a reduction in IgE level following specific treatment of strongyloidiasis, schistosomiasis, and amebiasis. Additionally, they show that an effective anti-parasitic treatment may produce a rapid and sometimes considerable (10 times) increase of serum IgE levels even though it was within normal limits. This boosting effect of antihelminthic treatment is likely to originate in the abrupt release of parasitic antigens from the killed parasites. It is suggested that repetitive quantitation of IgE from serum in patients with vague clinical pictures, suggestive of parasitic infestation, may be of some diagnostic value. The sharp increase in IgE levels is likely during the fourth week following administration of an effective treatment and a significant reduction is expected 5 months later.

2377 COMPARISON OF PYRANTEL AND MEBENDAZOLE IN THE TREATMENT OF ANCYLOSTOMIASIS: STUDY OF 40 CASES. *(Por.)* Conte, V. P.; Zaterka, S.; Costa, F. A. B.; Bettarello, A. (Fac. Med., Univ. Sao Paulo, Brazil). *Arq. Gastroenterol. Sao Paulo* 11(3):143-149, 1974.

Of 40 patients with ancylostomiasis and necatoriasis, either alone or in association with other parasitic diseases, 20 (12 males and 8 females, including 3 children) received pyrantel (20 mg/kg/day p.o. on 2 consecutive days) and 20 (9 males and 11 females, including 8 children) received mebendazole (200 mg/day on 3 consecutive days). Patients in both groups lived in an inland farm and were studied for 90 days after treatment. Parasitological examination of the stools showed that pyrantel cured 9 patients and reduced the number of eggs/g stools by an average of 73.3% in the remaining 11. Ascariasis was cured in all 5 patients in whom it was diagnosed, while 8 of

10 patients with whipworm responded to treatment. Mild side effects, which developed in 6 patients, consisted of anorexia, epigastric and abdominal pain, vertigo, pruritus, and diarrhea. Mebendazole cured 10 of the 20 patients who received it and reduced the number of eggs/g stool by an average of 86.3% in the remaining 10. All of 8 patients with associated ascariasis responded to mebendazole, as did 9 of the 11 with whipworm. Side effects, which occurred in 4 patients, consisted of vertigo, abdominal pain, and diarrhea. These results confirm that both pyrantel and mebendazole are effective in the treatment of hookworm and are well tolerated by most patients.

2378 DIFFERENCES IN IMMUNITY TO Nematospiroides dubius IN INBRED AND OUTBRED MICE. *(E.)* Lueker, D. C.; Hepler, D. I. (Dep. Microbiol., Colorado State Univ., Fort Collins). *J. Parasitol.* 61(1):159-160, 1975.

2379 THE TRANSMISSION OF HOOKWORMS, Salmonella, AND Shigella BY PALM WINE. *(Ger.)* Okafor, N.; Ikeme, M. M. (Dept. Microbiol., Univ. Nigeria, Nsukka). *Arch. Lebensmittelhyg.* 26(1):37-38, 1975.

2380 TREATMENT OF PERFORATED GASTRIC AND DUODENAL ULCERS IN PATIENTS WITH OPISTHORCHIASIS. *(Rus.)* Kirilenko, M. P.; Pinekenshtein, A. A. (Tyumen Reg. Clin. Hosp., USSR). *Klin. Khir.* (9):61-62, 1974.

2381 VERMINOUS APPENDICITIS CAUSED BY Enterobius vermicularis. *(Sp.)* Jofre Gutierrez, J. A.; Tersoglio, A. E.; Serra, D. E.; Gomez, S. C. (Fac. Med. Sci., Natl. Univ. Cuyo, Mendoza, Argentina). *Rev. Esp. Enferm. Apar. Dig.* 44(6):575-580, 1974.

2382 ANTIAMOEBIC ACTION OF ETOPHAMIDE IN CHILDREN *(E.)* Biagi, F.; Alvarez, R.; Gonzalez, C. (no affil.). *Trans. R. Soc. Trop. Med. Hyg.* 68(5): 368-369, 1974.

2383 INTER-AND INTRAFAMILIAL DISTRIBUTION OF Giardia lamblia INFECTION. *(E.)* Kettis, A. A.; Thoren, G. (Hosp. Infect. Dis., Stockholm, Sweden). *Scand. J. Infect. Dis.* 6(4):349-353, 1974.

2384 STUDIES ON MEDITERRANEAN LEISHMANIASIS. I. AN OUTBREAK OF VISCERAL LEISHMANIASIS IN NORTHERN ITALY. *(E.)* Pampiglione, S.; La Place, M.; Schlick, G. (Fac. Vet. Med., Univ. Bologna, Italy). *Trans. R. Soc. Trop. Med. Hyg.* 68(5):349-359, 1974.

2385 ANTHELMINTIC EFFECT OF THE GENTAMICIN COMPLEX AND COPRODUCED ANTIBIOTICS AGAINST TAPEWORMS OF LAMBS AND CATS. *(E.)* Panitz, E. (Anim. Health Res. Cent., Schering Corp., Allentown, N.J.). *J. Parasitol.* 61(1):157-158, 1975.

2386 EFFECTS OF INFECTION WITH PLEROCERCOIDS OF THE TAPEWORM, Spirometra mansonoides ON SERUM LIPIDS OF THE RAT. *(E.)* Phares, C. K.; Carroll, R. M.; Ruegamer, W. R. (Univ. Nebraska Med. Cent., Omaha). *Fed. Proc.* 34(3):939, 1975.

See also, 1923, 2182, 2189, 2210, 2211, 2264, 2316.

GENERAL

Regional Enteritis

2387 THE PULMONARY EXCRETION OF $^{14}CO_2$ IN PATIENTS WITH ILEAL RESECTION, CROHN'S DISEASE AND CONTROL SUBJECTS FOLLOWING ADMINISTRATION OF GLYCINE-1-^{14}C. *(E.)* Belfield, A.; Melikian, V.; Rao, K. P.; Stokes, P. O.; Cooke, W. T. (Gen. Hosp., Birmingham, England). *Experientia* 30(12):1429-1430, 1974.

Glycine-1-^{14}C (1 ml of glycine solution added to water) was administered immediately before breakfast to patients with bile salt deconjugation and to a control group with normal ileal function. The excretion of $^{14}CO_2$ in the breath was measured at 1/2, 1, 1 1/2, 2, 3, 4, 6, and 8 hr after ingestion of the test dose. For patients with ileal resection the fraction of the original dose excreted in the breath in the 0-8 hr period ranged from 0.116 to 0.213, a statistically significant difference from the range of 0.153 to 0.262 observed in controls. In both groups of subjects the pulmonary excretion of $^{14}CO_2$ obeyed bi-exponential kinetics. Three of the patients with ileal resection had low serum pyridoxal phosphate concentrations and 2 subnormal serum folates. Partial metabolic blocks due to deficiency of dietary co-factors may be the cause of the reduction in the amount of glycine metabolized to carbon dioxide. In spite of the finding that a reduction in the pulmonary excretion of $^{14}CO_2$ occurs in patients with Crohn's disease and ileal resection, the measurement of $^{14}CO_2$ excretion following oral glycine-1-^{14}C administration is seen as a worthwhile preliminary to the bile salt deconjugation test. An erroneous impression of the extent of intestinal bile salt deconjugation may be obtained if there is no prior knowledge of the patient's ability to convert glycine-1-^{14}C to $^{14}CO_2$.

2388 SURGICAL MANAGEMENT OF INFLAMMATORY BOWEL DISEASE IN CHILDREN. *(E.)* Becker, J. M.; Schneider, K. M.; Krasna, I. H. (Long Island Jewish-Hillside Med. Cent., New Hyde Park, N.Y.). *Paediatrician* 3(3/5):194-203, 1974.

2389 THE RELATIONSHIP AND EPIDEMIOLOGY OF ACUTE TERMINAL ILEITIS AND CROHN'S DISEASE. *(E.)* Kewenter, J.; Hulten, L.; Kock, N. G. (Dep. Surg. II, Univ. Goteborg, Sweden). *Gut* 15(10):801-804, 1974.

2390 THE PROTEAN MANIFESTATIONS OF CROHN'S DISEASE. *(E.)* Farmer, R. G. (Cleveland Clin. Found., Ohio). *Postgrad. Med.* 57(1):129-140, 1975.

2391 CROHN'S DISEASE OF THE COLON. I. FISTULA IN CROHN'S DISEASE OF THE COLON, CLASSIFICATION PRESENTING FEATURES AND MANAGEMENT IN 63 PATIENTS. *(E.)* Greenstein, A. J.; Kark, A. E.; Dreiling, D. A. (Mt. Sinai Sch. Med., City Univ. New York, N.Y.). *Am. J. Gastroenterol.* 62(5):419-429, 1974.

2392 DIFFUSE JEJUNO-ILEITIS OF CROHN'S DISEASE. *(E.)* Cooke, W. T.; Swan, C. H. J. (Gen. Hosp., Birmingham, England). *Q. J. Med.* 43(172): 583-601, 1974.

2393 GRANULOMATOUS CHEILITIS IN CROHN'S DISEASE. *(E.)* Carr, D. (R. Victoria Infirm., Newcastle upon Tyne, England). *Br. Med. J.* 4(5945): 636, 1974.

2394 CARCINOMA OF THE SMALL INTESTINE ASSOCIATED WITH TRANSMURAL ILEITIS (CROHN'S DISEASE). *(E.)* Savage, R. A.; Farmer, R. G.; Hawk, W. A. (Cleveland Clin. Found., Ohio). *Am. J. Clin. Pathol.* 63(2):168-178, 1975.

2395 CAUSES AND TREATMENT OF DIARRHEA IN CHRONIC INFLAMMATORY BOWEL DISEASE. *(Ger.)* Eckardt, V. (1st Med. Clin., Johannes Gutenberg Univ., Mainz, Germany). *Therapiewoche* 24(22):2504-2513, 1974.

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See also, 2088, 2132, 2133, 2134, 2135, 2143, 2337.

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1937
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1886*, 1943
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AND
CITATIONS

NATIONAL INSTITUTE OF ARTHRITIS, METABOLISM, AND DIGESTIVE DISEASES

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HEALTH, EDUCATION, AND WELFARE
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PREFACE

GASTROENTEROLOGY ABSTRACTS and CITATIONS is a publication of the National Institute of Arthritis, Metabolism and Digestive Diseases. This specialized information medium has been initiated to fill an existing great need in the field of gastroenterology and to assist the Institute in meeting its obligations to foster and support laboratory and clinical research into the nature, causes, and therapy of diseases of the gastrointestinal tract. Publication GASTROENTEROLOGY ABSTRACTS and CITATIONS makes available citations of all current papers relevant to this field from medical journals published throughout the world. Approximately one-third of the citations dealing with the major aspects of gastroenterology have accompanying abstracts.

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GASTROENTEROLOGY ABSTRACTS and CITATIONS is published monthly and includes citations and abstracts from the biomedical world literature as they are currently received. In addition, yearly cumulated subject and author indexes are published.

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The Secretary of the Department of Health, Education, and Welfare has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through April 30, 1975.

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NOTE

Journal names are abbreviated according to the list of abbreviations used by *Index Medicus*. For journals not covered by *Index Medicus*, the abbreviations (with some modifications) found in *World Medical Periodicals*, 3rd Edition, are used.

LANGUAGE ABBREVIATIONS

Afr.	Afrikaans	It.	Italian
Ar.	Arabic	Jap.	Japanese
Bul.	Bulgarian	Kor.	Korean
Ch.	Chinese	Latv.	Latvian
Cz.	Czech	Lith.	Lithuanian
Dan.	Danish	Nor.	Norwegian
Dut.	Dutch	Pol.	Polish
E.	English	Por.	Portuguese
Eston.	Estonian	Rum.	Rumanian
Fin.	Finnish	Rus.	Russian
Fl.	Flemish	Ser.	Serbo-Croatian
Fr.	French	Sl.	Slovak
Ger.	German	Sp.	Spanish
Gr.	Greek	Sw.	Swedish
Heb.	Hebrew	Th.	Thai
Hun.	Hungarian	Turk.	Turkish
Ic.	Icelandic	Uk.	Ukrainian
In.	Indonesian	Viet.	Vietnamese

ABBREVIATIONS USED IN ABSTRACTS

ACTH	adrenocorticotropic hormone	mm	millimeter(s)
ADP	adenosine diphosphate	mOsm	milliosmolar; milliosmeter(s)
AMP	adenosine monophosphate	msec	millisecond(s)
amp	ampere	mV	millivolt(s)
ATP	adenosine triphosphate	min	minute(s)
Å	angstrom	MTD	maximum tolerated dose
BSP	sulfobromophthalein	NAD	nicotanamide adenine dinucleotide
C	degrees centigrade	NADH	reduced nicotanamide adenine dinucleotide
cal	calories		
cc	cubic centimeter	NADP	nicotanamide adenine dinucleotidephosphate
cm	centimeter(s)		
dl	deciliter	NAPH	reduced nicotanamide adenine dinucleotidephosphate
DNA	deoxyribonucleic acid		
ED_{50}	median effective dose(s)	ng	nanogram (10^{-9})
EDTA	ethylenediamine tetraacetic acid	nm	nanometer(s)
e.g.	for example	Pa	ambient pressure
EEG	electroencephalogram	PAS	periodic acid — Schiff
ESR	erythrocyte sedimentation rate	pg	picogram (10^{-12})
g	gram(s)	pgEq	picogram equivalent(s)
µg	microgram(s)	p.o.	orally
Hz	Herz	ppb	parts per billion
hr	hour(s)	ppm	parts per million
i.m.	intramuscular	r	Roentgen
i.p.	intraperitoneal	RBC	red blood cells (erythrocytes), red blood count
IU	international unit(s)		
i.v.	intravenous	resp.	respectively
kcal	kilocalorie(s)	RNA	ribonucleic acid
kg	kilogram(s)	s.c.	subcutaneous
K_m	Michaelis constant	sec	second(s)
LD_{50}	median lethal dose(s)	SGOT	serum glutamic-oxalacetic transaminase
LDH	lactic acid dehydrogenase		
m	meter(s)	SGPT	serum glutamic-pyruvic transaminase
M	molar; mole(s)		
mM	millimolar; millimole(s)	U	unit(s)
µM	micromolar; micromole(s)	UV	ultraviolet
ma	milliampere(s)	V	volt
mCi, µCi	milli-, microcurie(s)	WBC	white blood cells (leukocytes), white blood count
mEq	milliequivalent(s)		
mg	milligram(s)	yr	year(s)
ml, µl	milli-, microliter(s)		

PRE-CLINICAL SCIENCES

MORPHOLOGY, CELLULAR STRUCTURE AND HISTOCHEMISTRY

2400 POSSIBLE CELLULAR LOCALIZATION OF CHOLECYSTOKININ-PANCREOZYMIN. *(E.)* Kubes, L.; Jirasek, K. (Fac. Hosp. Charles Univ., Hradec Kralove, Czechoslovakia). *Experientia* 30(8):961-963, 1974.

Cellular localization of cholecystokinin-pancreozymin was investigated by introducing 15 ml of 127 mM solution (pH 7) of L-phenylalanine (a stimulator of cholecystokinin-pancreozymin secretion) into the duodenum of three anesthetized adult dogs. Samples of duodenal mucosa were taken 15 min after phenylalanine administration in two dogs and after 20 min in one dog. The samples were fixed in 5% glutaraldehyde buffered at pH 7.4, postfixed with 1% OsO_4, and embedded in Vestopal W. Ultrathin sections were stained with uranyl acetate and lead citrate and examined by electron microscope. Enterochromaffin cells were visualized throughout the whole gastrointestinal mucosa from the cardia to the large intestine. D type endocrine cells were also stimulated by the administration of phenylalanine and were seen in the gastrointestinal mucosa from the fundus, where they are sparse, to the opening of the small intestine, with maximum occurrence at the upper part of the duodenum. Their secretion granules were rounded, ranging in size from 160-400 nm. None of the other endocrine cell types were stimulated by phenylalanine administration. The hormonal product of the D type cells has not yet been identified, but the localization of these cells, with their greatest occurrence in the duodenum, corresponds to the site of cholecystokinin-pancreozymin secretion as well as to motilin localization. It is suggested that cholecystokinin-pancreozymin rather than motilin is secreted by the D cells because motilin is released under alkaline conditions whereas the D cells are stimulated under acidic conditions.

2401 DIRECT QUANTITATIVE ESTIMATION OF PANETH AND TOTAL CELL POPULATIONS IN THE JEJUNAL GLANDS OF LIEBERKUHN. *(E.)* Malinin, G. I. (Dep. Biol., Georgetown Univ., Washington, D.C.). *Am. J. Anat.* 142(2):201-204, 1975.

Direct morphometric estimation of the number of intestinal crypts/10 mm length of jejunum, the total number of cells/crypt, and the number of Paneth cells/crypt, was performed using Zenker-fixed, serially sectioned small intestines from 12 adult BALB/c mice. The intestinal segments were serially sectioned 5 μ thick and stained with hematoxylin and eosin. The sections were cut using longitudinal and transverse planes of orientation, and measurement of intestinal structures made with stage and ocular micrometers. The mean volume of a crypt cell was estimated to be in the order of 6.6×10^{-4} mm^3, while the total volume of all cells in a single crypt was 1.833×10^{-1} mm^3. The cell population/crypt was 278 cells, of which 44 were Paneth cells. It was further estimated that 265 crypts/10 mm length of jejunum contained 7.4×10^4 cells, including 1.2×10^3 Paneth cells. The volume of all crypt and Paneth cells/10 mm length of jejunum was in the order of 49 and 8 mm^3, resp. The volume of the tunica muscularis and the surface area of the crypt's lumina were estimated to be 33.5 mm^3 and 118 mm^2, resp. Most of the data reported in this study were derived from 2 basic determinations: estimates of cell population/crypt and the number of crypts/U length of the intestine. The validity of numerical values presented is determined by the nature of the assumptions made concerning cell dimensions and arrangements and cell packing effects and by the accuracy of microscopic observations. The reliability of the microscopic observations was insured by a large number of measurements and reasonably small deviation from the mean. The excellent agreement between previously published estimates of the number of crypt cells and the number estimated using this method is taken as evidence that the assumptions made were valid ones. It is concluded, therefore, that the adopted methodological approach allows valid quantitative estimates of the intestinal crypt cell populations.

2402 HISTOCHEMICAL AND ULTRASTRUCTURAL CHARACTERIZATION OF A NEW TYPE OF ENDOCRINE CELL IN THE COLONIC MUCOSA OF THE RABBIT. *(Fr.)* Pradal, G.; Lefranc, G.; Tusques, J.; L'Hermite, A. (Fac. Med., Nantes, France). *J. Microsc. (Paris)* 19(2):129-236, 1974.

Fragments of colonic mucosa were removed from pentobarbital sodium-anesthetized adult male and female rabbits, some of which had been given an injection of L-dopa (60-100 mg/kg) 1 hr previously. In contrast to serotonin-containing cells which showed yellow fluorescence with the technique of Falk and Hillarp, many small cells with a pale green fluorescence were detected, particularly at the bottom of the crypts of Lieberkuhn, in contact with the basal membrane. These green cells were argyrophilic when stained by the technique of Grimelius, but not with that of Sevier and Munger; they were not argentaffinic when stained by the technique of Fontana and Masson. The green fluorescence disappeared after treatment with sodium borohydride or HCl vapors, and the cells did not react with glyoxylic acid vapors. In rabbits given L-dopa, serotonin-containing cells retained their original properties while the pale green cells became more intensely fluorescent. This suggests that the pale green cells take up and decarboxylate L-dopa and store dopamine. Examination of colonic mucosa under the electron microscope revealed that the secretory granules in the green cells differed markedly from those in serotonin-containing cells. The granules were rounded, did not exceed 350 nm in diameter, varied in density, and were sometimes heterogeneous. Granules in the same cell could exist in different states of maturation.

2403 ORIGIN, DIFFERENTIATION AND RENEWAL OF THE FOUR MAIN EPITHELIAL CELL TYPES IN THE MOUSE SMALL INTESTINE. V. UNITARIAN THEORY OF THE

ORIGIN OF THE FOUR EPITHELIAL CELL TYPES. *(E.)* Cheng, H.; Leblond, C. P. (Dep. Anat., McGill Univ., Montreal, Canada). *Am. J. Anat.* 141(4):537-561, 1974.

Presumptive evidence that the 4 main differentiated cell types in the epithelium of the mouse small intestine (villus columnar, mucous, entero-endocrine, and Paneth cells) originate from the same precursor, the crypt-base columnar cell, was obtained in previous studies. This possibility was examined using an approach based on the observation that, after injection of 2 or 10 μCi of ^{3}H-thymidine, some crypt-base columnar cells contained a vacuole including recognizable nucleus and cytoplasm. This vacuole was interpreted as a phagosome resulting from the ingestion of a non-viable cell and was used as a marker to follow the evolution of crypt-base columnar cells. In normal male adult mice, a rare crypt-base columnar cell includes a large phagosome containing Paneth cell remnants. By 6 hr after injection of 2 μCi ^{3}H-thymidine/g body weight, a number of crypt-base columnar cells included a different type of phagosome containing labeled nucleus and granule-free cytoplasm, which is attributed to phagocytosis of a labeled crypt-base columnar cell killed by β-radiation from the incorporated ^{3}H-thymidine. By 12 hr after ^{3}H-thymidine injection, phagosomes appeared in partly differentiated mid-crypt columnar cells and oligomucous cells; by 18-24 hr, in fully differentiated columnar cells and in Paneth cells; and by 30 hr, in an entero-endocrine cell. Since phagosomes are first found in crypt-base columnar cells and only later in the 4 differentiated cell types, it is concluded that crypt-base columnar cells transform into cells of these 4 types, and therefore, behave as the stem cells of the epithelium. The findings of rare epithelial cells containing 2 different types of secretory material (either mucous globules and entero-endocrine granules or mucous globules and Paneth cell granules) confirms that the stem cells are multipotential. These findings support the unitarian theory of epithelial cell formation in the small intestine.

2404 ENZYMATIC, FUNCTIONAL AND ULTRASTRUCTURAL DEVELOPMENT OF THE EXOCRINE PANCREAS. II. THE HUMAN PANCREAS. *(E.)* Track, N. S.; Creutzfeldt, C.; Bokermann, M. (Dep. Med., Univ. Gottingen, Germany). *Comp. Biochem. Physiol.* [*A*] 51(1):95-100, 1975.

The enzymatic and ultrastructural development of human fetal, newborn and adult pancreas was studied. Low protease levels (in activity/g wet weight) were found in pancreatic tissue from fetuses 10-30 cm in crown-heel length. Values for chymotrypsin and trypsin were under 0.05 and 0.5 mU/mg protein, resp. Fetuses from 40 cm in length to term showed increased levels of these enzymes (1.0 and 6.0 mU/mg protein, resp.). In the newborn, resp. values rose to 2.0-6.0 and 25-275 mU/mg protein, and in the adult to 5.0 and 100 mU/ protein. α-Amylase was detected only in adult pancreas. Phospholipase A and lipase levels increased over the gestational period from 0.2 to 0.8 and from 1.0 to 18.0 mU/mg protein, resp. Newborn levels were 0.4-0.6 and 15.0 mU/mg protein, resp. Adult values were 2.4 and 100-130 mU/mg protein, resp. Lipase activity in the duodenum increased from 0.04 to 5.00 mU/mg protein during gestation, while in adults, values ranged from 100 to 260 mU/mg for basal secretion and 344 to 1430 mU/mg after cholecystokinin stimulation. Duodenal contents of a 23.0 cm fetus showed under immunoelectrophoresis one strongly staining, two medium staining, and three weakly staining precipitation arcs; the three stronger ones being tentatively identified as lipase, trypsin 1, and anionic chymotrypsin. No arcs were found with smaller fetuses, and a large number of strongly staining arcs were found with adult specimens. Neither enzyme activity nor any electrophoresis arcs were found in amniotic fluid. Electron microscopy showed pancreatic cells from 8.5 cm fetuses were mainly undifferentiated tubular cells with no zymogen granules and few free ribosomes. The 12.5 cm fetus showed an increase in ribosomes and the appearance of some rough endoplasmic reticulum. The 14.0 cm fetus showed active Golgi zones, increase in mitochondria, small zymogen granules, and small lysosome granules. The 15.0 fetus to the 19.0 cm fetuses showed gradual increase in cellular activity, enhanced activity of the rough endoplasmic reticulum, condensing vacuoles, and zymogen granules of varying shape and size. The 21.0 to 26.0 cm fetuses showed a greater number of pancreatic cells with increased cellular activity and zymogen granule content. The 32.0 fetus showed still more highly organized exocrine cells the zymogen granules increased in number and electron density, and ductular lumina containing electron opaque material. The adult cell contained a prominant rough endoplasmic reticulum, and Golgi apparatus, and abundant dense zymogen granules in the cell apex in a limiting membrane. It is concluded that the human fetus can release pancreatic enzymes to digest swallowed amniotic fluid, and the development of this ability correlates with ultrastructural events in the exocrine cells.

2405 INTRACISTERNAL INCLUSION BODIES INDUCED IN ANIMALS: THEIR TRANSFORMATION AND SIGNIFICANCE. *(E.)* Watari, N. (Nagoya City Univ. Med. Sch., Japan). *J. Electron Microsc. (Tokyo)* 23 (4):255-268, 1974.

Electron micrographic studies in the pancreas of a number of species under normal and stressful conditions is reported. Two groups of bats (*Myotis lucifugus*) were kept at temperatures of 10 C and 20 C, resp., for four weeks, and the second group was fed after arousal. All were sacrificed within 4-24 hr. Wistar rats were kept at 1 C for 40 days and sacrificed. Dogs were given 200 mg/kg alloxan i.v. and sacrificed after 1-24 hr. Mice (ddy strain) were continually given 1 ppm γ-benzene hexachloride in drinking water for 1-12 months, or were injected with 200-400 IU vitamin A semiweekly for 1-18 months, or with 100 mg vitamin E daily for 2 weeks. Carp (*Cyprinus carpio*) were injected with 19 g/kg of 50% glucose i.p. and sacrificed after 1-2 hr. A cat with cystic fibrosis was sacrificed. For controls, intact animals of the above species, plus guinea pig and yellow-tail fish (*Seriola quinqueradiata*) were sacrificed. Pancreatic tissues of the animals were fixed in either 2.5% glutaraldehyde and 2% osmic acid, or in 1% osmic acid. Liver samples were also fixed in 1% osmic acid. Electron microscopy showed the population of cells containing the intracisternal inclusion bodies was low except in the exocrine pancreas of the rat after cold treatment, and of the normal guinea pig. The inclusion bodies were classified into six morphological types. A round granular type, electron dense, was found in a single form in guinea pig pancreatic acinar cells, and in a multiple form in post-hibernation bat pancreas, and mouse pancreas exocrine cells after vitamin A treatment. A multivesicular form with low electron density spherical bodies containing lower electron density vesicles was found in vitamin A-induced mouse hepatomas, and rarely in mouse hepatocytes exposed to γ-benzene hexachloride. A filamentous type resembling collagenous fibers was also found in the mouse hepatomas. A crystalline type, electron dense and rectangular, was observed in previous experiments, in rat pancreatic acinar cells, after chlorophenylalanine treatment. An irregular particular type with low electron density was found in hepatic cells of mice given vitamin E. A collodial type, very electron dense, consisted of three subtypes: a monocolloidal subtype (large spherical granules) found in islet B cells of intact carp; a multiconfigurational subtype found in the ganglion-like cells of carp pancreas 2 hr after glucose injection; and an arbor-like configuration subtype found in the anterior pituitary of marine teleosts kept in fresh water. It is suggested that these various inclusion bodies represent secretory substances retained in the endoplasmic reticulum when passage to the Golgi apparatus is inhibited.

2406 STUDIES ON THE DEPLETION AND ACCUMULATION OF MICROVILLI AND CHANGES IN THE TUBULOVESICULAR COMPARTMENT OF MOUSE PARIETAL CELLS IN RELATION TO GASTRIC ACID SECRETION. *(E.)* Ito, S.; Schofield, G. C. (Harvard Med. Sch., Boston, Mass.). *J. Cell Biol.* 63(2):364-382, 1974.

Parietal cell structure and function was studied by examining the cytological effects of insulin injection and reserpine administration in adult male Swiss-Webster mice. Differences in the range of forms among parietal cells of fasting *versus* fed mice were not striking, but cells with numerous tubules and vesicles were more common after fasting. Parietal cells showed a homogeneous appearance within 40 min after insulin (0.1-5 U/kg, i.p.) or pentagastrin (125 μg/kg) injections. These effects persisted for 2 hr. Cytoplasmic tubules were often completely depleted while there was a concomitant increase in both number and size of microvilli. Measurements of acid secretion in control animals and in animals treated with acid secretagogues indicated H^+ secretion contemporaneous with depletion of the cytoplasmic tubulovesicular membranes and with increase of the microvilli. Two sets of dose-dependent changes occurred in reserpine-treated fasting mice. In mice given low doses of reserpine (0.1-0.5 mg/kg, i.p.), parietal cells were similar in appearance to those in animals stimulated with insulin or pentagastrin. These changes occurred as early as 30 min after injection and persisted 5 hr. After administration of high doses of reserpine (5 mg/kg) changes opposite to those induced by insulin, pentagastrin, or low doses of reserpine were seen. Parietal cells accumulated cytoplasmic tubules and vesicles and had reduced numbers of microvilli 4 hr after injection which persisted for 24 hr. Sterological methods quantitated 10 different parietal cell components. Tracer studies with lanthanum revealed no continuity between tubules and the plasma membrane. There were, however, regions of close apposition between the tubulovesicular membranes and the cell membrane of the canaliculus, and instances where cytoplasmic tubules extended from the cell into the core of enlarged microvilli. These results support earlier findings that hydrogen ion release is associated with a reduction in the tubulovesicular membrane content of parietal cells and an increase in the area occupied by intracellular canaliculi and their microvilli. The results of this study suggest that a role for cytoplasmic tubules as reservoirs for the storage of a secretory product is unlikely. It is suggested that the dissolution of tubulovesicular membrane may be involved in some aspects of the reconstitution of new microvillous membrane. It seems probable that during secretion there is redistribution rather than complete loss of this membrane from the cells so that, during reconstitution of the tubules, some part of the membrane or membrane constituents is available for recycling.

2407 LIPOPROTEIN PARTICLES IN THE JEJUNAL MUCOSA OF FETAL RATS. *(E.)* Mak, K. M.; Trier, J. S. (Harvard Med. Sch., Boston, Mass.). *Dev. Biol.* 43(1):204-211, 1975.

Lipoprotein production was studied in the fetal rat small intestine. Forty-five fetuses from 15 timed pregnant Sprague-Dawley rats were obtained by laparotomy at gestational ages of 18-22 days. Segments of proximal jejunum were fixed in osmium tetroxide, stained with uranyl nitrate and saturated lead acetate, and examined by electron microscopy. Eighteen day fetal specimens showed no morphological evidence of lipoprotein, but 19 and 20 day specimens showed particles 250-500 Å in diameter in absorptive cells of the apical portions of developing villi. These corresponded in size, electron density, and intracellular location with adult very low density lipoprotein particles. The number of these particles was greatly increased in the 21 and 22 day fetuses, the diameters were from 500-800 Å, and were found mainly in the endoplasmic reticulum (in contrast to the particles from the 19-20 day specimens which were found mainly in the Golgi apparatus). It is concluded that fetal rat small intestine epithelium is capable of synthesizing lipoprotein particles.

2408 ELECTRONMICROSCOPIC STUDIES ON THE DIFFERENTIATION AND THE ONTOGENESIS OF GASTRIC EPITHELIUM CELLS OF RAT EMBRYO. *(E.)* Matsumoto, T. (no affil.). *Arch. Jpn. Chir.* 42(1):293-314, 1973.

The kinetics of growth and differentiation of rat gastroepithelial cells was studied by electron microscopy. Stomachs of embryonic and fetal rats *(Rattus norvegicus albus)* were excised and fixed in glutaraldehyde or osmium tetroxide, and stained in uranyl acetate and lead oxide. Development fell into 3 stages. The first, the plane stage, lasted from about 7-14 days of fetal age and was characterized by the first appearance of columnar cells, surface mucosal cells and cells possessing small granules among the undifferentiated cells. The undifferentiated cells at this point were distributed over the plane basal membrane in a monolayer. The gastric pit stage followed, lasting from 17-24 days of age. Urn-like arrangements of undifferentiated cells appeared and began to develop into gastric pits, containing mucous cells. Parietal cells and basal clear cells also began to appear. Finally, the stage of gastric chief gland formation lasted from birth to 28 days. During this time the chief cells and basal granular cells made their appearance. By 31 days after birth the gastric glands were similar to those of the adult.

2409 ENTEROCHROMAFFIN CELLS IN THE GUINEA PIG DIGESTIVE TUBE IN RELATION TO AGING. *(E.)* Gandalovicova, D. (Inst. Pharm. Biochem., Prague, Czechoslovakia). *Folia Morphol. (Praha)* 22(1):102-108, 1974.

The incidence of enterochromaffin cells in the stomach and small and large intestine was studied by the Masson-Hamperl argentaffin reaction and the diazo reaction in guinea pigs belonging to 4 age groups: 2 days, 60 days, 6 months, and 2 1/2 yr. The number of enterochromaffin cells was expressed as the count/1000 epithelial cells of the intestinal villi and the gastric and intestinal glands. The following results are presented in order of increasing age as defined by the four groups above. For the cardia, as determined by the argentaffin reaction, the incidence of enterochromaffin cells for the four age groups was 4.0, 11.7, 14.1, and 17.8. Also for the cardia, but determined by the diazo reaction, the incidence of enterochromaffin cells for the four age groups was 2.0, 7.8, 11.1, and 13.5. For the fundus, determined by the argentaffin reaction, the values were 2.31, 7.8, 8.9, and 11.1; determined by the diazo reaction, 0, 3.1, 2.5, and 2.8. For the pylorus determined by the argentaffin reaction, the values were 1.1, 2.9, 3.0, and 2.0; determined by the diazo reaction, 0, 0, 0, and 0. For the duodenum as determined by the argentaffin reaction, the values were 32.3, 35.9, 35.2, and 48.0; determined by the diazo reaction, 21.5, 24.0, 25.2, and 28.8. For the jejunum, as determined by the argentaffin reaction, the values were 17.5, 20.0, 21.7, and 27.6; determined by the diazo reaction, 7.8, 11.7, 12.0, and 15.0. For the ileum, determined by the argentaffin reaction, the values were 13.9, 16.1, 19.9, and 27.2; determined by the diazo reaction, 1.0, 3.5, 4.5, and 5.1. For the colon, determined by the argentaffin reaction, the values were 26.6, 17.7, 13.2, and 12.7; determined by the diazo reaction, 10.0, 3.3, 2.0, and 0.8. These results indicate that in practically all parts of the digestive tract, the enterochromaffin cell count rose from the group of guinea pigs aged 2 days to the group aged 2 1/2 yr, with the colon as an exception. The number of enterochromaffin cells visualized by the Masson-Hamperl silver impregnation method was larger than the number shown by the diazo reaction. Finally, it was concluded that the distribution of the enterochromaffin cells in the individual parts of the guinea pig digestive tract was, in general, similar in all age groups.

2410 TOPOGRAPHIC RELATIONS OF LYMPHATIC ENDOTHELIAL CELLS IN THE INITIAL LYMPHATIC OF THE INTESTINAL VILLUS. *(E.)* Collan, Y.; Kalima, T. V. (2nd Dep. Pathol., Univ. Helsinki, Finland). *Lymphology* 7(4):175-184, 1974.

Endothelial joint areas in the walls of initial lymphatics were studied with respect to morphology and interrelationships with each other. Specimens were taken from dilated and non-dilated lymphatics of 17 Sprague-Dawley rats and prepared for electron micrography. Dilation or non-dilation was produced by ligating the lymphatics at the base of the mesentery in 2 rats; venous stasis for 1, 10, or 20 min in 6 rats; 1 mg of papaverin administered i.v. in 2 rats; and the mesenteric veins opened for 5 min in 2 rats. There were 5 controls. Five serial sections were cut from 2 specimens with dilated lymphatics and open valves, 3 were from animals with venous stasis for 1 min, and 2 were from papaverin-treated animals. Each serial section had a light microscope section cut before and after the serial section. All sections were cut perpendicular to the intestinal villi at the central portion. Most joint areas contained 1-6 junctions which appeared to be zonulae adherentes. Joint areas were classified as simple (valve-like with 2 overlapping leaves) or complicated (containing more than 2 layers but no more than 2 cells, and having 1 or more cellular junctions). Simple joints were more common in dilated than compressed lymphatics. Serial sections showed that in both simple and complicated joints, closed areas sometimes changed to open ones, and that both joint types were mutually convertible to one another. It is concluded that variation of appearance of joint areas is due to both the natural structure of the lymphatic and its functional status.

2411 THE DEVELOPING HUMAN FETAL PANCREAS: AN ULTRASTRUCTURAL AND HISTOCHEMICAL STUDY WITH SPECIAL REFERENCE TO EXOCRINE CELLS. *(E.)* Laitio, M.; Lev, R.; Orlic, D. (Dep. Pathol., Univ. Turku, Finland). *J. Anat.* 117(3):619-634, 1974.

Zymogen granule production in human exocrine pancreas was studied during the middle trimester of fetal life, and the observations compared with corresponding adult pancreatic acinar organelles. For electron microscopy, fragments of pancreas were obtained from seven 9-20 week fetuses, fixed in glutaraldehyde, postfixed in osmium tetroxide and stained with toluidine blue, lead citrate and uranyl acetate, or left unstained. For histoenzymatic studies, tissues from three 15-20 week fetuses were cryostat sectioned at 6-8 µm. Enzymes studied included: alkaline phosphatase, acid phosphatase, leucine aminopeptidase, non-specific esterase, and thiamine pyrophosphatase. In addition, paraffin sections of pancreas from twelve 12-35 week fetuses were studied for general morphology, protein, and neutral glycoproteins to determine the time of appearance of exocrine acini and zymogen granules. Electron microscopy revealed no acinar cells in the 9 week pancreas, but a few appeared at 12 weeks containing small zymogen-like granules. During the 12-19 week period, the number of small zymogen granules gradually increased but were restricted to the area between the Golgi cisternae and the apical membrane. The small zymogen-like granules gradually decreased in number at the same time. Histoenzymatic studies demonstrated that pancreatic duct epithelial surfaces were negative for alkaline phosphatase at all fetal ages, while pancreatic stroma endothelium was positive. Non-specific esterase and leucine aminopeptidase were found in particulate deposits in acinar cytoplasm of all age groups. Thiamine pyrophosphatase was found in punctate deposits in acinar cell supranuclear cytoplasm, and did not vary with age. Light microscopy showed exocrine acini at 14-16 weeks. These showed a progressive increase in number of zymogen granules and cytoplasmic basophilia with toluidine blue. Paraffin sections showed primitive exocrine acini at the end of the third fetal month, but significant numbers of granules were not found until the fifth month. It is concluded that acinar cells appear by 12 weeks and mature over the next two months.

2412 COMPLETE IDENTIFICATION OF ENDOCRINE CELLS IN THE GASTROINTESTINAL TRACT USING SEMI-THIN-THIN SECTIONS TO IDENTIFY MOTILIN CELLS IN HUMAN AND ANIMAL INTESTINE. *(E.)* Polak, J. M.; Pearse, A. G. E.; Heath, C. M. (R. Postgrad. Med. Sch., London, England). *Gut* 16(3):225-229, 1975.

The serial semithin-thin section technique was used to demonstrate association of gastrin with G cells for complete identification of motilin cells in the small intestine. Small fragments of duodenal and jejunal mucosa from man, pig and dog were fixed and sectioned. Successive (serial) sections were subjected to immunofluorescence, silver impregnation and electron microscopy, or silver impregnation and light microscopy. Of 128 blocks, 28 were immunofluorescent for motilin, and only 12 could be used for correlation between light and electron microscopy due to technical difficulties. However, immunofluorescent motilin cells were shown to be identified with electron micrograph cells containing the electron dense nonspherical granules generally associated with enterochromaffin cells. Light microscopy further confirmed this by showing the storage granules of the motilin cells to be argentaffin. It is concluded that the enterochromaffin cell is the source of motilin, and that this technique offers the best possibility of correlation between ultrastructural morphology and immunocytochemistry.

2413 IMMUNOCYTOCHEMICAL LOCALIZATION OF SUBSTANCE P IN MAMMALIAN INTESTINE. *(E.)* Pearse, A. G. E.; Polak, J. M. (R. Postgrad. Med. Sch., London, England). *Histochemistry* 41(4):373-375, 1975.

Fresh samples of small and large intestine from man, dog, pig, and baboon were freeze dried and fixed in a number of non-aldehyde fixatives. The tissues were then subjected to indirect immunofluorescence with antibodies to synthetic substance P, using as controls normal rabbit serum as the first layer, second layer alone, or first layer antiserum with synthetic substance P. The controls were all negative and immunoreactive substance P was demonstrated in the cell bodies and processes in the plexuses of Auerbach and Meissner. In addition, immunofluorescence was found in the cytoplasm of numerous basigranular endocrine cells in the intestinal mucosa of all 4 species, tentatively identified as enterochromaffin cells. It is concluded that the enterochromaffin cell is probably of neuro-ectodermal origin.

2414 THE NORMAL HUMAN ESOPHAGEAL MUCOSA: A HISTOLOGICAL REAPPRAISAL. *(E.)* Weinstein, W. M.; Bogoch, E. R.; Bowes, K. L. (Dep. Med., Univ. Alberta, Edmonton, Canada). *Gastroenterology* 68(1):40-44, 1975.

In 19 asymptomatic subjects (18-47 yr old; 12 women and 6 men), a total of 95 mucosal suction biopsies were taken from multiple sites in the distal 10 cm of esophagus and examined for evidence of basal cell hyperplasia and elongated dermal papillae, features considered to be histological consequences of gastroesophageal reflux. Five of the 19 subjects had either a positive acid infusion test or an abnormal manometric study. In these 5 subjects, 7 of 25 biopsies (28%) were abnormal, whereas 29 of 70 (41%) biopsies were abnormal in the 14 subjects who had both a normal acid infusion test and manometry study. Features of basal cell hyperplasia and elongated dermal papillae were seen in 57% of the biopsies in the distal 2.5 cm of the esophagus and 19% of the biopsies above 2.5 cm. It is concluded that these histological criteria are unlikely to be of significant diagnostic value in a clinical setting when 1 or 2 biopsies are taken, even above the most distal 2.5 cm of esophagus.

2415 ARGENTAFFIN GRANULES IN ENDOCRINE CELLS IN HUMAN DUODENAL MUCOSA. *(E.)* Tateishi, R. (Cent. Adult Dis., Osaka, Japan). *Arch. Pathol.* 99 (4):220-224, 1975.

Ultracytochemical studies of the endocrine cells of human duodenal mucosa were made to correlate individual cell type with serotonin production. Tissues were obtained from 2 patients undergoing surgery for gastric carcinoma, fixed in glutaraldehyde, and subjected either to routine electron microscopy, or to electron microscopy after silver impregnation by either the argyrophil or argentaffin reactions. Normal electron microscopy divided the endocrine cells into 3 types according to the size and shape of the secretion granules. The first type had numerous granules less than 200 mμ in diameter with round cores that were either homogeneous and electron dense, or finely granular. The second type had fewer granules; these varied from 70-400 mμ in diameter and were uniformly round. The third type had generally a lower number of granules than the first 2, and measured from 100-500 mμ in the shortest diameter. The cores were electron dense, and either round, oval, tear-drop, rod-like, or concave. The silver grains of both argyrophil and argentaffin reactions precipitated on the cores of the granules in all 3 groups. Staining reactions were classified from 1+ to 5+ to designate increasing intensity. The first type, with the numerous 200 mμ granules, and the second type varied from 3+ to 5+ with the argyrophil reaction, but only from 1+ to 3+ with the argentaffin reaction. The third type, with the pleomorphic granules, showed heavy precipitations of 4+ and 5+ with the argentaffin reaction, and 4+ with the argyrophil reaction. It is concluded that all morphologic types of duodenal mucosal endocrine cells are positive for both argyrophil and argentaffin reactions; morphologic differences in secretion granules do not reflect differences in chemical nature; and that all endocrine duodenal cells are identical with respect to serotonin metabolism.

2416 ATROPHY OF VILLI WITH HYPERTROPHY AND HYPERPLASIA OF PANETH CELLS IN ISOLATED (THIRY-VELLA) ILEAL LOOPS IN RABBITS. LIGHT-MICROSCOPIC STUDIES. *(E.)* Keren, D. F.; Elliott, H. L.; Brown, G. D.; Yardley, J. H. (Johns Hopkins Univ. Sch. Med., Baltimore, Md.). *Gastroenterology* 68(1): 83-93, 1975.

Thiry-Vella loops in albino rabbit ileum were prepared by a new technique and were studied for 18 hr to 49 days postisolation to determine morphological changes. Possible reversal of villus atrophy and other changes after reimplantation into the intestine or after repeated perfusion with nutrient substances were also investigated. Either 1 or 2 ileal segments, 10-15 cm long, were isolated by transecting the intestine at a point 30 cm proximal to the ileocecal valve. In the method used to create the Thiry-Vella loops, portions of Silastic tubing about 25 cm long were prepared with 3 circumferential beads of adhesive on the end of the tubing which was to receive the loop. One bead was placed at the end of the tubing, the second bead 0.5 cm proximal to the first, and the third bead (with attached 2.0 silk suture for anchoring the abdominal wall) 1 cm proximal to the second. Adhesive-prepared tubing ends were inserted in the ends of the isolated loop and the free ends were passed through a s.c. tunnel from the edge of the incision to the area of the scapulae where they were exteriorized through a 2-cm incision. In 18 animals with Thiry-Vella loops, the loops became grossly shortened after 14 days. Histologically, some shortening and blunting of villi was detectable as early as 4 days postisolation; with prolonged isolation the changes became marked. Reduction in epithelial cell height and in brush border thickness was noted, and goblet cells were increased somewhat in size and prominence. There was only slightly increased chronic inflammation in the mucosa and acute inflammation was uncommon, suggesting that mucosal injury was minimal. Mean epithelial mitotic indices for the crypts did not rise and were generally reduced. Hyperplasia and hypertrophy of Paneth cells associated with mitotic figures in Paneth cells accompanied the atrophic changes in the villi. Reimplantation of loops into the bowel 3 weeks after isolation led to complete reversal of all changes, including hyperplasia of Paneth cells. Regular perfusion of loops with a solution containing a large variety of nutrient substances failed to reverse the mucosal changes. It is concluded that atrophy of villi in isolated ileum of the rabbit occurs mainly because 1 or more substances contained in the chyme are needed to maintain normal mucosal architecture. These substances probably help regulate epithelial cell turnover and may well be endogenous in origin. Loss of substances in the chyme after loop isolation may also have led to Paneth cell hyperplasia or the Paneth cell changes and atrophy of villi may be related in a cause-and-effect manner.

2417 EFFECT OF HYPOTHYROIDISM ON QUANTITATIVE FEATURES OF LIVER CELLS AND THEIR NUCLEI: A MORPHOMETRIC AND CYTOPHOTOMETRIC STUDY OF RAT LIVER CELLS THREE WEEKS AFTER THYROIDECTOMY. *(Ger.)* Riede, U. N.; Schmitz, E.; Robausch, T.; Kiefer, G.; Grunholz, D.; Sandritter, W. (Pathol. Inst., Univ. Freiburg/Breisgau, Germany). *Beitr. Pathol.* 154(2): 140-160, 1975.

Thyroidectomies were performed on 15 male Wistar rats weighing 80 g; five sham-operated rats served as controls. After 21 days the rats were sacrificed and cytophotometric and morphometric studies were performed on their livers. In thyroidectomized rats, determination of the relative DNA contents showed that the ratio of diploid to tetraploid cells was 9:1, while in controls this ratio was 6:4. Thyroidectomy reduced the volumes of individual cells and their nuclei by half and doubled the volume of nucleoli. The average number of nucleoli/cell was 4 in both groups of rats. Thyroidectomy reduced the mitochondrial volume/nucleus by about 30% and decreased the number of mitochondria/nucleus by almost 50%. A 40% increase occurred in the area of the external membranes of the mitochondria, while the area of crista membranes/U mitochondrial volume decreased by 25%, the area of crista membranes/nucleus by 33%, and the number of mitochondrial granules/U mitochondrial volume by 50%. Thyroidectomy doubled the volume of peroxisomes and reduced the volume and number of peroxisomes/nucleus and the number of peroxisomes/U cytoplasm volume by about 25%. The volume of free ribosomes/nucleus decreased greatly. The relative volume of lysosomes/U volume of cytoplasm and nucleus decreased by 50%, while the number of lysosomes/nucleus and U volume of cytoplasm decreased by almost 90%. The volume of the rough endoplasmic reticulum decreased without any change occurring in the area of its membrane, suggesting that the lumen of each cisterna had narrowed. Similar changes have been observed in starvation. The relative volume of the smooth endoplasmic reticulum increased relative to the cytoplasm but not relative to the nucleus. These changes are attributed to reduced cellular metabolism in hypothyroidism.

2418 LAPAROSCOPIC AND MORPHOLOGICAL ASPECTS OF SUPERFICIAL LYMPHATIC VESSELS IN THE LIVER.

(Ger.) Meyer-Burg, J.; Mielke, F.; Arbeiter, G. (Steglitz Clin., Free Univ., Berlin, Germany). *Leber Magen Darm* 4(6):280-291, 1974.

After a review of the normal anatomy of lymphatics in the liver capsule, changes these vessels undergo in liver disease are described and methods for visualizing them are discussed. Superficial lymphatics can be seen in the normal liver at laparoscopy. Their absence is an indication of diffuse metastases in the liver of advanced cirrhosis. Apart from the upper and lower surfaces of the left and right convexities, lymphatics can also be observed in the falciform ligament of the liver and gallbladder wall. In fatty liver and acute and chronic hepatitis, lymph vessels are increased in number, dilated and, in some cases, filled with more fluid than in normal livers. In portal hypertension the volume of lymph is increased, but the cross-section of lymph vessels is reduced as a result of cirrhosis. Lymphangiectasis is observed in the capsules of cirrhotic livers but, in contrast to lymph vessels in the hepatoduodenal, falciform, and coronary ligaments, their walls are not hypertrophied. Stenosis and dilatation of the lymph vessels are observed in chronic aggressive hepatitis. As in animal experiments, when a dye was injected under pressure directly into lymphatics on the surface of the liver, if there was not enough albumin in the lymph to bind with the dye, the dye emerged from the lymph vessels after several minutes. If the emerging lymph cannot be absorbed, ascites starts to form. Lymph cysts, which are actually fliud-filled pseudocysts ranging in size from a pinhead to a cherry, are present in normal livers but occur in larger numbers in cirrhosis. In extrahepatic obstructive jaundice, lymph vessels are filled with a yellowish-green fluid at laparoscopy. This results from retrograde filling of the lymphatics with substances normally found in the bile. Similarly, RBC have been found in the lymph system in cirrhosis due to the development of lymphovenous or venolymphatic shunts. Lymph vessels in the capsule of the liver can be visualized by indirect injection of dyes into the splenic and hepatic veins or by direct injection of dyes, contrast media, or ^{198}Au into superficial lymphatic vessels in the liver. In contrast to animal studies, which showed that patent blue is excreted from the biliary tract in rats, this dye is excreted *via* the lymphatics in man. This difference is probably species specific. Direct injection of ^{198}Au into the superficial lymphatics to visualize the retroperitoneal space is not of great diagnostic value since scintigraphic resolution is poor.

2419 PRESENCE OF CELLS COMBINING FEATURES OF TWO DIFFERENT CELL TYPES IN THE COLONIC CRYPTS AND PYLORIC GLANDS OF THE MOUSE.

(E.) Nabeyama, A. (Dep. Anat., McGill Univ., Montreal, Canada). *Am. J. Anat.* 142(4):471-484, 1975.

Cells combining features of two different cell types were found in the colonic crypts and pyloric glands of the mouse. Specimens of descending colon (1 cm above pelvic rim) and pyloric antrum (near duodenum) from Swiss albino mice were fixed in paraformaldehyde and glutaraldehyde, postfixed in osmium tetroxide, stained with uranyl acetate and lead hydroxide, and examined by electron microscope. The normal cell pattern in the colonic crypt base consisted of about 83% vacuolated cells (containing a few membrane bound, 0.8 μm wide spheroids enclosing some 5 nm thick threads and 7 nm particles); 13% mucous cells (containing a few membrane bound 0.8 m wide spheroid mucous globules packed with dense 8 nm dot-like particles); 4% entero-endocrine cells (containing relatively few spheroidal or irregular granules, 100-300 nm, and occasional bundles of filaments near the nucleus); and 0.5% caveolated cells (having long microvilli, prominent filaments, and deep surface invaginations). All were rich in free ribosomes and relatively poor in secretory material. However, occasional cells were found resembling the vacuolated cells but also containing entero-endocrine type granules. Other vacuolated-type cells were found containing mucous globules in addition to the normal vacuoles. These were rich in free ribosomes in both types only when the vacuoles predominated over the granules or mucous globules. The pyloric glands were composed of numerous mucous cells with a few entero-endocrine cells, and an occasional caveolated cell. However, cells were found containing both mucous globules and entero-endocrine type granules and filaments and abundant free ribosomes. Cells resembling caveolated cells were also found, that contained mucous globules. Scarcity of secretory material and abundance of free ribosomes are signs of cellular immaturity; therefore it is suggested that in the descending colon the vacuolated cells transform into either mucous or entero-endocrine cells, and in the pylorus the mucous cells transform into entero-endocrine cells or caveolated cells.

2420 ELECTRON MICROSCOPE STUDIES OF RAT LIVER AFTER ORAL ADMINISTRATION OF CHENODEOXYCHOLIC ACID.

(Ger.) Leuschner, U.; Neuenfeldt, H. U. (Cent. Intern. Med., Johann Wolfgang Goethe Univ., Frankfurt/Main, Germany). *Z. Gastroenterol.* 13(1):27-34, 1975.

To determine whether chenodeoxycholic acid (CDC) causes morphological changes in the liver, it was given to 5 groups of 5 young male Wistar rats each in doses of 20 mg/kg p.o. through a stomach tube every day for 5-60 days. Another group of 5 rats received 29 mg/kg CDC for 30 days and 60 mg/kg for 30 days. No ultrastructural changes were found in the livers of rats treated with CDC for 5 and 14 days. Of the 5 rats given CDC for 20 days, 2 had dilated bile capillaries and a decrease in the number of villi with an occasional increase in the smooth endoplasmic reticulum and slight swelling of the mitochondria. Similar findings were observed in all 5 rats given CDC for 30 days. When CDC was administered for 60 days, light vacuoles, surrounded by a simple membrane, were found in all 5 rats; the contents of these vacuoles resembled those of the sinusoids. The vacuoles varied in size and were detected in all of the rats, but were not present in all of the cells. Tripling the dose of CDC had no effect on the findings. Invaginations of the sinusoidal cell membrane, which varied in size, and many cystic dilatations of the intercellular spaces suggest that the vacuoles might have formed by invagination of the external cell membrane.

2421 EPITHELIAL PROLIFERATION IN THE PROXIMAL GASTROINTESTINAL TRACT OF THE RABBIT. *(Ger.)* Strauss, P.; Koburg, E. (Clin. Otorhinolaryngol., Univ. Dusseldorf, Germany). *Arch. Otorhinolaryngol.* 208(1):49-59, 1974.

^{3}H-Labeled thymidine was administered i.v. or i.p. to rabbits 30 min to 96 hr before animals were sacrificed, and its incorporation into DNA was measured by autoradiography in the soft palate, upper and lower surface of the tongue, esophagus, and duodenum. In all tissues studied, the duration of mitosis (M) was 1.5 hr, and the duration of DNA synthesis (S), 8 hr (7 hr in the duodenum). Considerable variations were observed in the duration of the G_1 period and the time required for a cell to migrate between the germinative layer and the area adjoining the area of desquamation (T). The minimal duration of the G_2 period was limited to 30 min for all tissues studied. Each mitosis is assumed to result in the production of 2 f_1 cells which are equal in their ability to develop. Examination of the basal layer was sufficient to calculate the duration of the cell cycle C which ranged from 14.2 hr in the duodenum to 45 hr in the esophagus. If the percentage of ^{3}H-labeled cells is known, only the order of magnitude of the renewal time can be estimated.

2422 LYSIS OF LIVER CELLS CONTAINING ALCOHOLIC HYALIN BY NEUTROPHILIC GRANULOCYTES - AN ELECTRON MICROSCOPE STUDY. *(Ger.)* Rumpelt, H. J.; Thoenes, W. (Inst. Cytobiol. Cytopathol., Univ. Marburg/Lahn, Germany). *Verh. Deutsch. Ges. Pathol.* (57):247-251, 1973.

The lysis of hepatocytes with alcoholic hyalin by neutrophilic granulocytes was studied by electron microscopy in biopsy material from patients with alcoholic liver cirrhosis. Neutrophilic granulocytes were found to establish contact over a large surface with the plasma membrane of the hepatocyte without any conspicuous changes in the adjacent hepatocellular or granulocytic cytoplasm. Then, the contact surfaces show more or less extended membrane defects which involve either the hepatocellular membrane, or additionally also the granulocytic membrane. These defect sites are zones in which hepatocellular and granulocytic cytoplasms are mixed with each other. The hyalin material is subsequently released from the destroyed hepatocyte and into the sinusoid. The findings indicate the leukotactic character of hyalin-containing hepatocytes with yet closed cell membrane. Once a leukocyte wall is formed, the hepatocyte membrane, and often even the granulocyte membrane are dissolved, and the hyalin-containing hepatocyte undergoes cytolysis without any preliminary morphological signs of cell death.

2423 MORPHOLOGY AND MEASUREMENTS OF THE SMALL INTESTINE MUCOSA IN NORMAL CHILDREN. *(E.)* Toccalino, H.; Iovannitti, C.; Gallardo, F. (Profesor Alejandro Posadas Polyclin., Haedo, Argentina). *Acta Gastroenterol. Latinoam.* 6(1):43-46, 1974.

2424 DIRECT FOURFOLD MAGNIFIED IMAGE OF FINE-STRUCTURE FOR LARGE INTESTINE MUCOUS MEMBRANE. *(Jpn.)* Kunieda, T.; Fukutomi, Y.; Shibayama, M.; Ogushi, Y. (Med. Sch. Fifu Univ., Japan). *Jpn. J. Clin. Radiol.* (19):697-702, 1974.

2425 SOME ASPECTS OF MITOCHONDRIA HAVING A "SEPTUM". *(E.)* Wakabayashi, T.; Asano, M.; Kurono, C. (Nagoya City Univ. Med. Sch., Japan). *J. Electron Microsc. (Tokyo)* 23(4):247-254, 1974.

2426 THE LOCATION OF ALBUMIN IN HEPATOCYTES DURING MATURATION OF THE LIVER. *(Fr.)* Guillouzo, A.; Feldmann, G. (Beaujon Hosp., Clichy, France). *Biol. Gastroenterol. (Paris)* 7(4):334-335, 1974.

2427 ERYTHROBLAST ISLETS: ANATOMIC UNIT OF HEMATOPOIETIC TISSUE IN FETAL RAT LIVER. *(Fr.)* Nagel, J.; Billat, C. (Lab. Anim. Physiol., Fac. Sci., Reims, France). *Arch. Anat. Microsc. Morphol. Exp.* 63(2):147-162, 1974.

2428 ULTRASTRUCTURE OF BASAL CELL ADENOMA OF THE PAROTID GLAND. *(E.)* Gyorkey, F.; Min, K. W.; Sirbasku, D.; Gyorkey, P. (VA Hosp., Houston, Texas). *Lab. Invest.* 32(3):448, 1975.

2429 PRELIMINARY REPORT ON THE EFFECTS OF VAGOTOMY ON THE ULTRASTRUCTURE OF RAT PARIETAL CELLS. *(E.)* Helander, H. F. (Dep. Anat., Univ. Umea, Sweden). *Acta Hepatogastroenterol. (Stuttg.)* 22(1):65, 1975.

2430 ENZYMATIC ALTERATIONS IN DEGENERATED AREAS OF THE INTESTINAL MUSCULATURE IN LABORATORY MICE. *(E.)* Mullink, J. W. M. A.; Kroes, R. (Cent. Inst. Breed. Lab. Anim., TNO, Zeist, Netherlands). *Beitr. Pathol.* 154(2):182-189, 1975.

2431 ASBESTOS FIBERS IN THE COLONIC WALL. *(E.)* Westlake, G. E. (Child. Hosp., San. Francisco, Calif.). *Environ. Health Perspect.* 9:227, 1974.

See also, 2456, 2519, 2523, 2532, 2575, 2660, 2786, 2800, 2802, 2803, 3113, 3766.

ABSORPTION-EXCRETION-TRANSPORT

2432 INCREASED INULIN ABSORPTION FROM THE CAT STOMACH EXPOSED TO ACETYLSALICYLIC ACID.

(E.) Flemstrom, G.; Marsden, N. V. B. (Biomed. Cent., Univ. Uppsala, Sweden). *Acta Physiol. Scand.* 92(4): 517-525, 1974.

The absorption of the ^{14}C-labeled polysaccharide inulin from the stomach of the cat was studied to determine if molecular species sufficiently large to be antigenic could be absorbed from the gastric lumen after exposure to acetylsalicylic acid. Six ml of an isotonic solution containing 12.5 μCi inulin with 15 mM acetylsalicylic acid (pH 2.70, 86% unionized) were introduced into the stomach through a glass cannula in the pyloric wall. The experiment lasted 6 hr and the urine volume and ^{14}C activity were measured at hourly intervals. The absorbed inulin was rapidly excreted and accumulated in the urine in sufficient quantities for molecular weight distribution analysis. About 95% of the urinary inulin had a molecular weight greater than 2000 and only moderate molecular sieving of the instilled inulin (average molecular weight 5200) occurred. This suggests that larger molecular species than tested could be absorbed from the stomach. The instillation of ^{14}C-inulin in acetylsalicylic acid-free isotonic NaCl, however, also resulted in a smaller but significant inulin absorption. The latter was further considerably reduced if the inulin was not added together with the isotonic saline, but later (20 min) in a small liquid volume, suggesting that mere distension of the stomach causes a temporary increase of the permeability which, however, is much smaller than that after acetylsalicylic acid. The acetylsalicylic acid-induced increase in ^{14}C activity in the urine reached a maximum during the second hr after instillation and thereafter declined slowly. It is suggested that ^{14}C activity after the second hr is probably due to a reduction of the acetylsalicylic acid-induced permeability increase caused by the loss of acetylsalicylic acid from the lumen, that is, the acetylsalicylic acid effect is reversible. It is concluded that acetylsalicylic acid increases gastric absorption of saccharide molecules of a size previously reported to be sufficiently large to evoke immune reactions.

2433 ABSORPTION OF CARBOHYDRATES AND VITAMINS IN THE PRESERVED AND TRANSPLANTED SMALL INTESTINE.

(E.) Toledo-Pereyra, L. H.; Simmons, R. L.; Najarian, J. S. (Dep. Surg., Univ. Minnesota, Minneapolis). *Am. J. Surg.* 129(2):192-197, 1975.

The absorptive ability of the entire small intestine of adult mongrel dogs of either sex for carbohydrates and vitamins was studied after preservation for 24 hr by hypothermic pulsatile perfusion and allotransplantation. After transplantation, azathioprine (5.0 mg/kg/day) was given i.v. for 3 days and then reduced to 2.5 mg/kg/day i.v. until death. P.o. alimentation was begun by the seventh postoperative day. Dogs receiving small intestine perfused for 24-hr survived a mean of 23.7 days. The main causes of death were cachexia, rejection, and intestinal obstruction. The body weight decreased gradually to values of 30.3% from the control weight at 4 weeks postgrafting; no regain in body weight was noted. Anemia and hypoproteinemia were also present. In dogs with perfused small intestine allografts the absorption of D-xylose was significantly impaired in the first 3 weeks after transplantation. An improvement in absorption values was observed at 5 weeks post grafting. The absorption of vitamin A was also reduced during the first week post transplantation, but lower normal limits were reached at 3 weeks after transplantation. Dogs that survived more than 5 weeks had normal absorption patterns of vitamin A. Absorption of vitamin B_{12} was not significantly altered after transplantation, always remaining within normal limits. Dogs in which intestinal allograft rejection developed had a progressive decrease in the intestinal absorption patterns. Intestinal denervation and the use of immunosuppressive drugs are factors that are involved in the impairment of absorption of small intestine allografts. The interruption of lymphatic drainage apparently does not play a significant role in the poor absorptive capacity of the transplanted intestine because lymphatic regeneration occurs in an average of 2-3 weeks after surgery when the functional capacity of the small intestine was still impaired.

2434 EFFECT OF SODIUM, MANNITOL, AND MAGNESIUM ON GLUCOSE, GALACTOSE, 3-O-METHYLGLUCOSE, AND FRUCTOSE ABSORPTION IN THE HUMAN ILEUM.

(E.) Bieberdorf, F. A.; Morawski, S.; Fordtran, J. S. (Univ. Texas Southwest. Med. Sch., Dallas). *Gastroenterology* 68(1):58-66, 1975.

The kinetics of sugar absorption in the human ileum *in vivo* were studied in an effort to reconcile a discrepancy resulting from previous experimental findings, namely that active sugar absorption *in vitro* is absolutely dependent on the presence of Na ions on the luminal side of the mucosa but that previous *in vivo* studies in the ileum of rat, dog, and man have shown that active glucose absorption is almost as rapid from a Na-free mannitol solution as from a NaCl solution. Absorption of 3 actively transported sugars (glucose, galactose, and 3-O-methylglucose) having different apparent K_m values and of fructose (absorbed by a separate carrier-mediated process) were measured in the human ileum in normal adults of both sexes, 21-45 yr old, using constant perfusion techniques. Perfusion solutions contained NaCl or Na substitutes and a sugar. Perfusion rate was 15 ml/min. Mannitol substitution for Na resulted in a slight reduction (23%) in the active absorption of glucose. Mg substitution for Na resulted in a greater depression (45%) of glucose absorption. The apparent K_m for glucose absorption was increased when Na was replaced by Mg, but the maximal absorptive rate (V_{max}) was not altered. Mg did not depress glucose absorption or the apparent K_m for glucose transport when Na was present in the perfusion solution. Neither Na removal nor Mg had any effect on fructose absorption. Absorption of galactose and 3-0-methylglucose (low affinity sugars for the glucose carrier) was reduced by about 40-50% when mannitol replaced Na, but Mg substitution for mannitol in a Na-free medium did not further depress absorption of these sugars. The following conclusions were reached: 1) part of the discrepancy between previous *in vitro* and *in vivo* experiments was due to the type of test sugar (glucose *versus* glucose analogue) and the solute used to replace Na in the luminal solution; 2) Mg is more effective than mannitol in reducing Na concentration at the glucose transport site on the brush border; 3) luminal Na ions have an important effect on active sugar absorption in the human small intestine *in vivo* as they do *in vitro*; 4) there is a component of active sugar absorption (about 1/2) which appears to be independent of luminal Na ions *in vivo*.

2435 THE EFFECT OF ANGIOTENSIN ON ISOSMOTIC FLUID ABSORPTION BY THE RABBIT GALL-BLADDER IN VITRO. *(E.)* Leyssac, P. P.; Kristensen, L. O.; Christensen, P.; Frederiksen, O. (Univ. Inst. Exp. Med., Copenhagen, Denmark). *Acta Physiol. Scand.* 92(4):508-516, 1974.

Evidence that angiotensin II inhibits net fluid transport by the gallbladder when applied to the serosal side was examined in further detail using the gallbladders of female white rabbits. Angiotensin inhibited net fluid transfer at serosal concentrations between 10^{-9}-10^{-8} M. Maximum inhibition (about 25%) was obtained at a concentration of 5 x 10^{-9} M. No significant effect was demonstrable at concentrations of 10^{-10} M or lower, and the effect disappeared at higher concentrations (10 and 20 x 10^{-9} M). The inhibitory effect was due to a depression of the unidirectional Na^+-efflux (from mucosal to serosal side); Na^+-influx (from serosal to mucosal side) was unaffected. Maximum effective doses of angiotensin had no effect on transepithelial potential difference; ohmic resistance increased slightly (about 10%). The inhibitory effect of angiotensin was significantly reduced by incubating gallbladders with indomethacin (10 μg/ml) which effectively blocks prostaglandin biosynthesis. Addition of indomethacin alone had no effect on either net fluid transfer rate, potential difference, or ohmic resistance. It is concluded that angiotensin inhibits isosmotic fluid transport in the gallbladder by an effect on the active component of the transfer process. The data suggest that the effect is indirect and mediated, in part at least, by release of endogenous prostaglandins, or alternatively that indomethacin might interfere with the angiotensin receptor.

2436 KINETICS OF TAUROCHOLATE UPTAKE BY THE PERFUSED RAT LIVER. *(E.)* Reichen, J.; Paumgartner, G. (Dep. Clin. Pharmacol., Univ. Bern, Switzerland). *Gastroenterology* 68(1):132-136, 1975.

The uptake of taurocholate by the perfused liver of male SPF rats of the Sprague-Dawley strain was studied by the multiple indicator dilution technique using single injections of ^{14}C-labeled taurocholate and ^{99m}Tc-labeled albumin. The livers were perfused *in situ* at a mean perfusion rate of 1.85 ml/min/g liver and at a mean perfusion pressure of 11.5 cm of H_2O. During each of 5 experiments, 3 to 6 doses (75 to 25,000 nM) Na taurocholate, each labeled with 4 nCi of Na taurocholate 24-^{14}C were given. Prior to administration, each dose of taurocholate was mixed with 10 μCi [^{99m}Tc]albumin in erythrocyte-free perfusion solution and injected rapidly in a constant volume of 0.21 ml into the portal vein cannula. Albumin and ^{51}Cr-labeled erythrocytes were injected together at the beginning and end of each experiment to determine the intra- and extravascular space of the liver. Total hepatic venous outflow was collected in 2-sec intervals. Taurocholate was distributed into an extravascular space equivalent to that of albumin. The taurocholate dilution curves appeared to be related to the albumin curves in a single exponential manner for the whole range of doses studied. Analysis of the dilution curves revealed that the initial taurocholate uptake rate increased with increasing taurocholate dose in a nonlinear fashion, exhibiting saturation kinetics which obeyed the Michaelis-Menten equation. The erythrocyte space was 15.8% of the liver weight and did not change significantly throughout one perfusion. The albumin and taurocholate space were 8.4 and 8.5% of the liver weight, resp., and did not differ significantly. The initial maximal uptake was found to be 32.5 nM/sec/g liver, a value exceeding the maximal steady state capacity for excretion of taurocholate into the bile. The half-saturation constant was 90.6 nM/g liver. It is concluded that this system is operating far from saturation at physiological levels of bile acids in portal blood. It is also suggested that taurocholate binds to some receptor or carrier of the hepatocyte but under the conditions of this experiment, it is not possible to differentiate between concentrative transport, facilitated transfer, or simple diffusion with subsequent binding to an intracellular receptor.

2437 STUDIES OF INTESTINAL ABSORPTION UNDER PATHOLOGICAL CONDITIONS. III. EXPERIMENTAL STUDIES OF GLUCOSE ABSORPTION DISORDER CAUSED BY SODIUM LAURYL SULFATE. *(E.)* Sugimura, F. (Nihon Univ. Sch. Med., Tokyo, Japan). *Nihon Univ. J. Med.* 16(2):173-189, 1974.

Glucose absorption through the intestinal wall of adult male white rabbits which had been damaged by exposure to 5% sodium lauryl sulfate solution was studied *in vivo* using a portal blood collecting technique. The lower small intestine was ligated at 2 sites 30 cm apart, after which a heparin-coated catheter was inserted into a relatively thick branch of the portal vein draining blood through small branches coming from a segment of the intestine between the 2 ligatures. The portal blood was collected in 5-min samples for the duration of each experiment. Ten ml of 5% glucose solution was injected into the lumen of the lower small intestine between the 2 ligatures by syringe in 5 normal rabbits and the portal blood collected every 5 min to estimate sugar level. In 2 of the 5 animals, the portal blood drained out continuously for a relatively long time, 80 and 105 min. The blood sugar level increased gradually and almost linearly for about 70 min after the injection and remained almost on the same level thereafter. When 10 ml of 5% glucose was injected into the lower small intestine 60 min after the injection of 10 ml of 5% sodium lauryl sulfate, glucose absorption through the intestinal wall rose linearly for the duration of the experiment (70 and 95 min, in 2 of 5 rabbits injected), indicating a pattern corresponding to passive diffusion. When 10 ml of 5% glucose containing an additional 5% sodium lauryl sulfate was injected into the lower small intestine, glucose absorption rose parabolically up to a definite height and thereafter remained on the same level in 2 of 5 rabbits (portal blood flow lasted for 60 and 120 min). It is concluded that sodium lauryl sulfate causes changes not only in the structure of the intestine but also in the mechanism of intestinal absorption. It is further concluded that the portal blood collecting method makes it feasible to study intestinal absorption under physiological conditions with minimum autolysis and no or mild tissue damage.

2438 HEPATOCELLULAR UPTAKE OF TAUROCHOLATE IN THE DOG. *(E.)*

Glasinovic, J. C.; Dumont, M.; Duval, M.; Erlinger, S. (INSERM, Beaujon Hosp., Clichy, France). *J. Clin. Invest.* 55(2):419-426, 1975.

The uptake of taurocholate by the liver of the intact dog was studied by the multiple-indicator dilution method in 22 experiments involving eight dogs and the kinetic characteristics of the uptake process determined. ^{51}Cr-labeled RBC (vascular indicator), ^{125}I-labeled albumin (an extravascular reference), and [^{14}C]taurocholate were injected into the portal vein. Different doses of unlabeled taurocholate were included in the injection mixture which had a total volume of about 1 ml. Hepatic venous samples were taken every 2 sec from an outflow catheter; sampling rate ranged from 1.0-1.5 ml/sec. Two to four sets of dilution curves were obtained in the same animal, with an interval of at least 45 min. As a consequence of the hepatic uptake, the outflow recovery of [^{14}C]-taurocholate was much reduced when compared to that of albumin, but its recovery increased with increasing doses of taurocholate, suggesting a progressive saturation of the uptake process. The analysis of the dilution curves fitted a 3-compartment model system well. No return of the extracted taurocholate to the extracellular space could be detected. The initial space of distribution of taurocholate was 1.22 times greater than that of albumin. Analysis of the data for uptake was consistent with Michaelis-Menten kinetics. The calculated initial maximal velocity of uptake was 4.53 μM/sec/100 g liver and the dose yielding half-maximal velocity was 7.11 μM/100 g liver. The maximal velocity of uptake was about 6 times the known maximal capacity of biliary secretion of taurocholate in the dog. It is concluded that these results are consistent with the hypothesis that the uptake of taurocholate is carrier-mediated.

2439 CHANGES IN INTESTINAL ABSORPTION IN THE SWINE AFTER ACUTE IRRADIATION. *(Fr.)*

Remy, J.; Daburon, F.; Villiers, P. A.; Chenut, M. C.; Nizza, P. (Lab. Appl. Radiobiol., At. Energy Comm., Jouy-en-Josas, France). *Strahlentherapie* 148 (1):95-106, 1974.

Two groups of 4 Pitman Moore pigs each, aged 8-15 months, were exposed to γ-radiation from ^{60}Co. Those weighing 25-50 kg were given only water for 15 hr before exposure to 1500 rads and were maintained on water until they died, while those weighing 20-35 kg were given only water for 15 hr before exposure to 800 rads and received water for 3 days after irradiation. Animals in the first group received no protection, while those in the 2nd group were partially protected by lead plates over the body from the xyphoid process of the sternum to the occipital crest, permitting survival of 6-8% active bone marrow. Except for 1 pig given infusions of amino acids, minerals, and vitamins 21 days after irradiation, no treatment was given to either group. Within 1 hr after irradiation with 1500 rads, glucose absorption decreased to 3%, Ca absorption to 4%, and Na absorption to 11.7% of preirradiation values. Except for glucose absorption, which increased on day 2, these decreases persisted at about the same level until day 4. Irradiation with 800 rads also reduced glucose, Na, and Ca absorption, but this decrease was not as great and did not occur until 2-4 days after irradiation. Na and glucose absorption tended to increase again 2 weeks after irradiation, but Ca absorption remained below normal for several months in 1 pig although blood Ca levels remained within normal limits throughout the experiment. While irradiation with 800 rads did not produce a gastrointestinal syndrome in the swine, growth was completely arrested in 1 of the pigs for 4 months as a result of malabsorption.

2440 A PROPOSED MECHANISM FOR ZINC ABSORPTION IN THE RAT. *(E.)*

Evans, G. W.; Grace, C. I.; Votava, H. J. (Hum. Nutr. Lab., Agric. Res. Serv., US Dep. Agric., Grand Forks, N.D.). *Am. J. Physiol.* 228(2):501-505, 1975.

The uptake of zinc by the epithelial cell basolateral plasma membrane was studied, along with the effect of albumin on membrane-bound zinc. Labeled zinc was added to pancreatic secretions from a mongrel dog or to pancreatic supernatant from male Sprague-Dawley rats, after which zinc binding was measured. In other experiments, the whole-body absorption of ^{65}Zn was measured in rats in which the common bile duct or the hepatic duct was ligated, and the effect of the pancreatic zinc-binding ligand on zinc uptake by the intestinal epithelial cells was examined using everted small intestinal segments. Both the dog pancreatic secretions and the rat pancreatic supernatant fraction contained a low-molecular-weight ligand which bound zinc. The whole-body absorption of ^{65}Zn in rats in which the common bile duct was ligated was significantly less than that in normal animals or animals in which the hepatic bile duct had been ligated. Although jaundice was present in all ligated rats, it had no apparent effect on zinc absorption. When the zinc-binding ligand from the dog pancreatic secretions was added to a labeled buffer solution, the *in vitro* uptake by rat intestinal epithelial cells was significantly greater than that in buffer solution containing no ligand. Following *in vivo* labeling, 30% of the ^{65}Zn in the epithelial cells was associated with the partially purified basolateral plasma membrane. When labeled basolateral plasma membranes were incubated in a medium containing zinc-free albumin, approximately 96% of the ^{65}Zn was transferred to the medium; less than 30% of the isotope was released into media containing no albumin or a 3:1 zinc:albumin complex. In rats fed a zinc-deficient diet, ^{65}Zn absorption was inversely proportional to the serum zinc concentration, and both zinc and copper injections produced a marked decrease in ^{65}Zn absorption. These results suggest that zinc absorption consists of interactions among a low-molecular-weight ligand, receptor sites on the basolateral membrane, and metal-free albumin.

2441 BILIARY EXCRETION OF IODIPAMIDE. *(E.)*

Loeb, P. M.; Berk, R. N.; Feld, G. K.; Wheeler, H. O. (San Diego Sch. Med., Univ. California, La Jolla). *Gastroenterology* 68(3):554-562, 1975.

The dose and rate of iodipamide necessary for optimal biliary excretion with the least risk of toxicity were investigated. Three adult mongrel dogs had cholecystectomies and Thomas cannulas inserted in the duodenum opposite the duodenal papilla. Indwelling Silastic catheters in both external jugular veins were used for blood collections and infusions. Dogs were fasted for 24 hr before bile collection, and 0.5 mg/kg of pipenzolate methylbromide were initially administered i.v. followed by a dose of 0.1 mg/kg every 20 min to minimize bile flow fluctuations. An i.v. infusion of 1.5% sodium taurocholate solution was given throughout to replace bile salts lost. When bile flow was constant, control samples of blood and bile were collected, and a 15.3% solution of methylglutamine iodipamide was infused at 7 increasing rates between 0.33 and 7.33 μm/min/kg. After 30 min at each rate a 3 ml sample of bile was collected, a blood sample was collected at the midpoint of each collecting period, and iodine concentrations of both were measured. In 2 experiments, urine was also collected, and its iodine concentration determined. When the infusion rate of iodipamide was increased stepwise from 0.33 to 4.0 μm/min/kg, the plasma concentration increased in a linear fashion from 0 to 0.83 μm/ml. At 7.33 μm/ml/kg, the plasma concentration rose at a slower rate. The rate of excretion and concentration of the drug in the bile increased markedly at lower plasma concentrations and began to plateau when the plasma concentration reached 0.4 to 0.6 μm/ml. As the iodipamide infusion rate was increased, biliary iodipamide excretion increased sharply up to an infusion rate of 2 μm/min/kg after which progressively smaller increments of the drug were excreted. The drug did not appear in the urine until the plasma concentration had reached 0.20 m/ml, after which the rate of excretion in the urine increased in a linear fashion. At a plasma concentration of 0.20 the ratio of biliary to urinary excretion was 14, while at a plasma concentration of 0.60 the ratio was less than 2. When a steady state of plasma concentration and biliary excretion was reached at each constant iodipamide infusion rate, the total excretion rate of the drug in bile and urine was less than the rate of infusion. The excretory deficit increased as the plasma concentration increased. It is concluded that by slow infusion, high plasma concentrations could be avoided, and the smallest dose necessary for radiographic visualization could be given.

2442 THE EXSORPTION CHARACTERISTICS OF VARIOUS SUGARS. *(E.)*

Axon, A. T. R.; Creamer, B. (St. Thomas' Hosp., London, England). *Gut* 16(2):99-104, 1975.

The exsorption patterns of glucose, galactose, xylose, mannose, and lactulose from rabbit plasma to intestinal lumen were compared. Each sugar was injected *via* external cannula into the jugular vein in a solution containing 1 g of creatinine. After a 15-min equilibration period, intestinal perfusate was collected for a 10-min period and the concentrations of the test substance in the plasma and perfusate were determined using quantitative paper chromatography. With lactulose, mannose, and xylose, there was a direct relationship between exsorption rate and plasma concentration. The intestinal clearance of xylose was significantly greater than that of mannose or lactose; the latter two did not differ significantly in this respect. At low concentrations there appeared to be a barrier preventing glucose and galactose from reaching the lumen; virtually no exsorption took place until the plasma concentration reached 50 μM/ml, and even at 100 μM/ml exsorption was slow. When the plasma concentration was increased, however, the exsorption rate increased considerably. Phlorizin (10^{-2} M) completely abolished the mucosal barrier to glucose; luminal glucose (140 μM/ml) had a similar effect on galactose exsorption. 2,4-Dinitrophenol had no effect on the exsorption of glucose, and removal of sodium from the luminal perfusate had no effect on galactose exsorption. The data suggest that there are two barriers which prevent actively absorbed monosaccharides from passing from plasma to lumen: an anatomical one which restricts all large water-soluble molecules to some extent; and a specific barrier which is related to the active absorption mechanism.

2443 INFLUENCE OF DEHYDROCHOLATE AND TAUROCHOLATE ON BROMSULPHTHALEIN UPTAKE, STORAGE,

AND EXCRETION IN THE DOG. *(E.)* Delage, Y.; Erlinger, S.; Duval, M.; Benhamou, J. P. (INSERM, Beaujon Hosp., Clichy, France). *Gut* 16(2):105-108, 1975.

The influence of dehydrocholate on bromsulphthalein relative-storage capacity, biliary transport maximum, and fractional transfer rates between plasma, liver, and bile were studied in unanesthetized mongrel dogs. In six dogs, storage capacity, biliary transport maximum, and fractional transfer rates from plasma to liver, liver to bile, and liver to plasma were measured during 0.15 M NaCl infusion. The measurements were repeated under a dehydrocholate infusion of 95 μM/min, an infusion rate approaching the known biliary transport maximum of bile salts. The storage capacity and fractional transfer rates from plasma to liver were significantly lower during dehydrocholate infusions (18 mg/mg/100 ml and 0.120 mg/mg/min, resp.) than during NaCl infusions (47 mg/mg/100 ml and 0.280 mg/mg/min, resp.). The transport maximums and fractional transfer rates from liver to bile were also significantly lower during dehydrocholate infusions (3.2 mg/min and 0.013 mg/mg/min, resp.) than during NaCl infusions (4.8 mg/min and 0.033 mg/min, resp.). In three additional experiments, taurocholate had similar effects to those of dehydrocholate on storage capacity and transport maximum. These findings suggest that competition occurred between the bile salts and bromsulphthalein from hepatic uptake and storage. They support the hypothesis that the decreased disappearance rate and relative storage capacity of bromsulphthalein observed during biliary obstruction may be due to competition between bile salts and bromsulphthalein for hepatic uptake and storage.

2444 **EFFECT OF DIETARY LACTOSE ON THE ABSORPTION OF PROTEIN, FAT AND CALCIUM IN THE POST-WEANING RAT.** *(E.)* Leichter, J.; Tolensky, A. F. (Div. Hum. Nutr., Sch. Home Econ., Univ. British Columbia, Vancouver, Canada). *Am. J. Clin. Nutr.* 28(3):238-241, 1975.

The effect of different dietary levels of lactose on the excretion of protein, fat, and calcium was studied in the postweaning rat, which has a low level of intestinal lactase activity. Young male Sprague-Dawley rats were maintained for 13 days on diets containing 10% lactose, 30% lactose, 10% sucrose, or 30% sucrose. Food intake, weight gain, and the fecal and urinary excretion of protein, nitrogen, and calcium were monitored over the last 10 days. The 30% lactose group showed the lowest food intake, lowest weight gain, and lowest food efficiency. The urine volume in the two lactose groups was significantly higher than in the sucrose groups. The fecal fat and nitrogen excretions were also significantly higher in the lactose groups, but the fecal calcium was lower in the lactose groups; the latter difference was significant only in the case of the 30% lactose group. The lactose and sucrose groups did not differ significantly in urinary nitrogen excretion, but urinary calcium excretion was significantly higher in the 30% lactose group. These findings suggest that dietary lactose may reduce the absorption of protein and fat, but not of calcium, in individuals with low levels of intestinal lactase activity.

2445 **INTESTINAL TRANSPORT OF TRYPTOPHAN AND ITS ANALOGS.** *(E.)* Bosin, T. R.; Hathaway, D. R.; Maickel, R. P. (Med. Sci. Program, Indiana Univ., Bloomington). *Am. J. Physiol.* 228(2):496-500, 1975.

The role of the indole nucleus in the active intestinal transport of tryptophan and its 1-methylindole and benzo(b)thiophene analogs was studied *in vitro* in the rat and hamster. Everted intestinal sacs prepared from adult male Sprague-Dawley rats and adult male golden hamsters were filled with test solutions containing tritium-labeled D,L-tryptophan or one of its analogs. Both tryptophan and tryptophan-benzo(b)thiophene were actively transported across the intestinal tissues, while tryptophan-1-methylindole was not actively transported. There was no significant difference between the K_m and maximal transport velocity (V_{max}) values or between, resp., K_m and V_{max} values of the former two when compared between rat and hamster. Tryptophan transport in the rat was competitively inhibited in the presence of the benzo(b)thiophene analog, while the 1-methylindole analog was unable to inhibit tryptophan transport. The transport of tryptophan and its benzo(b)thiophene analog was depressed at high concentrations (10 M), and all three amino acids produced subtle alterations in the barrier properties of the intestinal sacs, as evidenced by increased tetraethylammonium $[^{14}C]$-bromide diffusion. The results indicate that tryptophan and its benzo(b)thiophene analog share the same carrier and interact in a competitive fashion, while the 1-methylindole analog appears to be inert with respect to carrier interaction. The results also indicate the importance of the 1-position of the indole nucleus as a site for steric interaction of tryptophan with the carrier molecule.

2446 **SITES OF ORGANIC ACID PRODUCTION AND ABSORPTION IN GASTROINTESTINAL TRACT OF THE PIG.** *(E.)* Argenzio, R. A.; Southworth, M. (Dep. Physiol. Biochem. Pharmacol., New York State Vet. Coll., Cornell Univ., Ithaca). *Am. J. Physiol.* 228(2):454-460, 1974.

The effect of diet and time elapsed after feeding and the pH and production of volatile fatty acids in the gastrointestinal tract was studied in the pig. Growing pigs were maintained on a commercial diet containing 20% protein or on a high-cellulose, low-protein diet containing 3% protein and 3% urea. On the day of the experiment, the animals were killed 2, 4, 8, or 12 hr after the morning meal and the pH and volatile fatty acid content in their gastrointestinal tracts determined. In parallel studies, the *in vitro* absorption of volatile fatty acids was measured in samples of large intestinal and stomach mucosa from pigs on the commercial diet. In animals fed the control diet, the contents of the cranial half of the stomach showed marked, cyclic fluctuations in pH and high concentrations of organic acids. The contents of the caudal (glandular) half were lower in both pH and organic acid concentration. Despite concentrations of volatile fatty acids as high as 250 mEq/liter in the large intestine, the pH remained relatively neutral. The volatile fatty acid levels remained relatively constant throughout the length of the colon. In the animals fed the low-protein, high-cellulose diet, there was no weight gain. The pH of the gastric and duodenal contents was lower and that of the remaining small and large intestinal contents was higher than in the controls. Concentrations of the volatile fatty acids in the gastric and large intestinal mucosa were considerably lower than in the controls. In the *in vitro* studies, all four types of gastric mucosa absorbed and transported volatile fatty acids at substantial rates, although the cecal and colonic mucosa transported these acids at much greater rates than the gastric mucosa, the equine large intestinal mucosa, or the bovine rumen epithelium. The results suggest that: 1) substantial amounts of carbohydrate undergo microbial digestion in the stomach and large intestine of pigs fed a high-concentrate growing ration; 2) the volatile fatty acids are readily absorbed and may provide an important source of energy; and 3) that the production and absorption of these fatty acids may have a major effect on the secretion and absorption of sodium and water by the large intestine.

2447 RESPONSE OF ACTIVE TRANSPORT OF IONS AND SPONTANEOUS WATER FLUX TO OSMOTIC GRADIENTS IN GASTRIC MUCOSA. *(E.)* Villegas, L. (Cent. Biophys. Biochem., Venezuelan Inst. Sci. Invest., Caracas). *Am. J. Physiol.* 228(3):738-741, 1975.

The effects of symmetric changes in the mucosal and serosal bathing solutions on cell water content, net ion flux, and net water movement were studied in the isolated frog gastric mucosa. Mucosas from *Rana pipiens* were bathed in hyposmotic (165 mOsm/kg water), buffered hyposmotic, isosmotic (226 mOsm/kg water), or hyperosmotic (286 mOsm/kg water) solutions. There was a linear correlation between cell water content in the mucosa and osmolality of the solutions. A similar correlation was found between cell water content and osmolality of the nutrient solution. While there was a significant correlation between the observed net water flux and osmolality, there was no significant correlation between the transmucosal potential difference and the osmolality of the solution. Similarly, acid secretion was significantly correlated with osmolality, but short-circuit current, transmucosal potential difference, and conductance were not. It is postulated that similar effects on spontaneous ion and water fluxes might occur if the tonicity were changed only at one surface rather than both. The data obtained question the validity of measuring transmucosal osmotic permeability without making appropriate corrections for the changes in spontaneous fluxes related to cell osmolality changes such as those observed in the absence of transmucosal osmotic gradients.

2448 STIMULATION OF ACTIVE AND PASSIVE SODIUM ABSORPTION BY SUGARS IN THE HUMAN JEJUNUM. *(E.)* Fordtran, J. S. (Univ. Texas Health Sci. Cent. Dallas, Southwest. Med. Sch.). *J. Clin. Invest.* 55 (4):728-737, 1975.

The effects of glucose and fructose on water and sodium absorption in the human jejunum were compared to assess the relative contributions of the active and passive sugar stimulation of sodium transport. The effect of fructose was assumed to be entirely passive, and the difference between the effects of fructose and glucose was assumed to be a measure of sugar-stimulated, active sodium absorption. Nine normal subjects were studied with the triple-lumen perfusion system; water and electrolyte movement with mannitol served as a base line for quantitating the effects of fructose and glucose. At 130 mM sugar, glucose and fructose stimulated water and sodium absorption equally/mM sugar absorbed. Under conditions where glucose and fructose were absorbed at approximately equal rates, the stimulated rates of water and sodium absorption/mM sugar absorbed were about 30% lower with fructose than with glucose. The two sugars stimulated chloride absorption to approximately the same extent and in proportion to the stimulated water and sodium absorption rates. Glucose, however, stimulated more chloride absorption/mM sugar absorbed than did fructose. Compared with fructose, glucose had a 20-30% greater effect on the absorption of urea. Glucose stimulated potassium secretion and fructose stimulated potassium absorption. Neither sugar significantly affected sodium movement when bicarbonate or sulfate, rather than chloride, was the major anion present in the perfusing solution. It is concluded that glucose stimulates passive and active sodium transport in the human jejunum. Stimulated active sodium absorption generates an electrical potential across the mucosa that causes sodium and potassium secretion and partly or completely nullifies the effect of active sodium transport on net sodium movement. Net sodium absorption stimulated by glucose is mainly the passive consequence of solvent flow. The accompanying anion determines the degree to which sugars stimulate sodium absorption. The effects of bicarbonate and sugars on jejunal sodium absorption are not additive.

2449 EFFECTS OF UNILATERAL SODIUM REPLACEMENT ON SUGAR TRANSPORT ACROSS IN VITRO RABBIT ILEUM. *(E.)* Rinaldo, J. E.; Jennings, B. L.; Frizzell, R. A.; Schultz, S. G. (Univ. Pittsburgh Sch. Med., Pa.). *Am. J. Physiol.* 228(3):854-860, 1975.

The effects of unilateral sodium replacement in the perfusion medium on the passive and active transport of 3-*O*-methyl-D-glucose across the isolated rabbit ileum were studied, using choline chloride and mannitol in place of sodium. Replacement of sodium in the serosal solution alone did not significantly affect the net passive movement of 3-*O*-methyl-D-glucose from the mucosal solution to the serosal solution. However, when sodium was replaced in the mucosal solution alone, the net passive absorption of 3-*O*-methyl-D-glucose did not differ significantly from that observed when both the mucosal and serosal solutions were rendered sodium-free. The results with choline chloride were nearly identical with those obtained with mannitol. The presence or absence of sodium in the serosal solution did not significantly affect the rate of active 3-*O*-methyl-D-glucose absorption, while replacement of sodium in the mucosal solution inhibited sugar absorption. The results did not differ significantly when sodium was replaced with choline or mannitol. There was good agreement between the bi-directional fluxes of mannitol and 3-*O*-methyl-D-glucose when the mucosal solution alone was rendered sodium-free by replacement with choline. The results indicate that replacement of sodium in the mucosal solution alone essentially abolishes transcellular 3-*O*-methyl-D-glucose transport and that the remaining transepithelial fluxes are largely due to diffusion through the paracellular or shunt pathway.

2450 EFFECT OF ETHANOL INGESTION ON DUODENAL CALCIUM TRANSPORT. *(E.)*

Krawitt, E. L. (Dep. Med., Univ. Vermont, Burlington). *Lab. Clin. Med.* 85(4):665-671, 1975.

The effect of ethanol and duodenal calcium transport and the concentrations of intestinal proteins was studied. Male albino rats were given 20% ethanol as the sole source of fluid for 12 days; in some cases the rats had been raised on a vitamin D-free diet. Vitamin D and 25-hydroxycholecalciferol were administered i.p. or intragastrically 24 hr before death. The chronic ingestion of ethanol resulted in a significant depression of calcium transport by everted duodenal gut sacs. The administration of vitamin D_2, D_3, or 25-hydroxycholecalciferol did not completely restore the ability of the gut sacs to transport calcium. In rats fed a vitamin D-deficient diet, ethanol did not affect the serosal:mucosal ratios when compared to vitamin D-deficient controls, nor did it interfere with the ability of pharmacologic doses of vitamin D to increase the rates of transport when given 24 hr before experimentation. Ethanol ingestion caused a decrease in the protein concentration in the duodenal 38,000 x g supernatant, but did not significantly affect the calcium-binding activity. Ethanol also depressed the activity of duodenal alkaline phosphatase; this activity was restored to normal levels by vitamin D administration 24 hr before death. Duodenal alkaline phosphatase activity was also depressed in starved, non-ethanol-treated rats. Ethanol ingestion did not significantly affect ATPase activity. The results suggest that ethanol interferes with calcium transport by a mechanism at least in part independent of the vitamin D pathway and that changes in alkaline phosphatase and calcium transport, although both affected by vitamin D, may represent independent metabolic consequences.

2451 THE ABSORPTION AND SUBSEQUENT UTILIZATION OF LECITHIN BY THE RAT JEJUNUM. *(E.)*

Rodgers, J. B.; O'Brien, R. J.; Balint, J. A. (Dep. Med., Albany Med. Coll., NY). *Am. J. Dig. Dis.* 20 (3):208-213, 1975.

The utilization of luminal lecithin for the synthesis of microsomal and prochylomicron-chylomicron lecithin was studied during a period when the intestine was actively absorbing dietary lipid. Bile fistula male Sprague-Dawley rats were infused with a mixture of liquid diet, sodium taurocholate and lecithin at a rate of 2.4 ml/hr; bile salts and labeled lecithin were added to the liquid diet on the day of use. The animals were killed and samples of intestinal microsomes and intestinal prechylomicrons plus chylomicrons obtained. The specific activities of the isotopes in lecithin were determined using liquid scintillation spectrometry. After 1 hr, significant quantities of the three isotopes were present in the microsomal lecithin. Less radioactivity was recovered from the prechylomicron-chylomicron lecithin than from the microsomal lecithin, ^{32}P being particularly reduced in the former. Total recoveries of lecithin were much greater from the microsomal fraction (3.94 mg) than from the prechylomicron-chylomicron fraction (0.53 mg); thus, the specific activities of ^{3}H and ^{14}C were uniformly greater in the latter. The ratio of glycerol to palmitate in the microsomal and prechylomicron-chylomicron fractions was very similar to the ratio in the original lecithin, as was the glycerol:phosphate ratio in the microsomal fraction. The results indicate that luminal lysolecithin formed by the hydrolysis of lecithin by pancreatic phospholipase can be absorbed without further digestion and reutilized for mucosal lecithin synthesis. They also suggest that when sufficient lysolecithin is present in the intracellular compartment, the major pathway for lecithin synthesis is *via* acylation of this substrate, and that the major role of lysolecithin absorbed from the intestinal lumen after lecithin digestion is for lipoprotein production.

2452 REGULATION OF INTESTINAL CALCIUM-BINDING PROTEIN BY CALCIUM INTAKE IN THE RAT. *(E.)*

Freund, T.; Bronner, F. (Univ. Connecticut Health Cent., Farmington). *Am. J. Physiol.* 228(3):861-869, 1975.

The effect of dietary intake on the rat intestinal calcium-binding protein was studied. Male Sprague-Dawley rats were maintained on semisynthetic diets containing 0.06% calcium and 0.2% phosphorus, 1.5% calcium and 1.5% phosphorus, 0.5% calcium and 0.5% phosphorus, or 1.5% calcium and 0.2% phosphorus. All diets contained 2,200 IU/kg vitamin D_2. In addition, some animals were maintained on diets similar to the latter two, but with no added vitamin D_2. The calcium-binding protein of the intestinal mucosa of these animals was assayed using analytical gel electrophoresis. The binding capacity of the calcium-binding protein was significantly higher in the material obtained from the animals fed the low calcium diet than in that from the animals fed the high calcium diet. The binding activity from rechromatographed calcium-binding protein existed as two bands on polyacrylamide electrophoresis. In material from the animals on the low calcium diet, there was little activity in the form of band 1, whereas in the material from the animals on the high-calcium diet, more than half was in the form of band 1. Both bands were vitamin D-dependent. When animals on the high-calcium diet were placed on a low calcium diet, their calcium-binding protein concentration increased by

35% within 24 hr and by 48% within 48 hr, by that time reaching a level typical of animals on a low-calcium diet. Measurement of the diurnal variation in calcium-binding protein and mucosal calcium in animals allowed access to feed only at night, revealed significant inverse oscillations. The results suggest that the calcium-binding capacity (i.e., calcium-binding protein) is an inverse function of the calcium concentration of the mucosal tissue, which, in turn, appears to reflect absorbed calcium in transit.

2453 ANALYSIS OF THE COMPONENTS OF BILE FLOW IN THE RHESUS MONKEY. *(E.)* Strasberg, S. M.; Ilson, R. G.; Siminovitch, K. A.; Brenner, D.; Palaheimo, J. E. (Dep. Surg., Univ. of Toronto, Canada). *Am. J. Physiol.* 228(1):115-121, 1975.

The components of bile flow was studied in three groups of rhesus monkeys. In the first group the clearance of [^{14}C]-erythritol was shown to be a canalicular process by using monkeys that had the bile flow diverted externally and who had been given [^{14}C]-erythritol (0.02 µCi, infused by peristaltic pump), sodium taurocholate (10 mM/day, i.v.), and secretin (20 U/hr, i.v.). Flow, canalicular clearance, bile salt secretion, and bicarbonate secretion were studied in a second group of monkeys after resection of the gastric antrum and small bowel. These animals were given sodium taurocholate (6-10 mM/day i.v.), and erythritol-^{14}C (0.01 µCi/min steady infusion). Canalicular clearance of erythritol was shown to be equal to canalicular flow. Ductular reabsorption was constant at all bile salt secretion rates in the individual animal, and bicarbonate secretion was dependent on bile salt secretion. In group 3 bile flow, bile salt secretion, bicarbonate secretion and canalicular flow were studied over a 2 week period while the animals received intraduodenal sodium taurocholate (3-10 mM/day) and labeled (0.01 µCi/min) and unlabeled erythritol (6-10.0 mM/day) during feeding and fasting. The variability in bile flow in the fasting animal at one bile secretion rate was linearly related to bicarbonate secretion. A multivariate regression model was proposed to describe bile flow in the rhesus monkey based on these study groups. This model enabled the authors to show that the variations in the relationship between bile flow and bile salt secretion rate, in the fasting animal, were due to ductular flow, related to the secretion of bile salt-independent bicarbonate.

2454 ELECTROPHYSIOLOGY OF THE FROG GASTRIC MUCOSA WITH SUFFICIENT CO_2. *(E.)* Kidder, III, G. (Sch. Dent., Univ. Maryland, Baltimore). *Am. J. Physiol.* 228(3):928-933, 1975.

Electrophysiological parameters were compared in bullfrog gastric mucosa perfused with a solution containing 5% CO_2 (standard) and 10% CO_2 (for maximum acid secretion), in the gaseous phase. The mucosa was removed, mounted in a chamber, and perfused with bicarbonate-Ringer solution on the serosal surface and similar but unbuffered solution on the mucosal surface. Acid secretory rate was measured by the pH-stat method, and potential difference by KCl/calomel reference electrodes. Measurements were made during the last 30 min of a 1 hr experimental period. Tissues were exposed either to the 5% or the 10% solution. The secretory rates were 2.17 and 4.44 µEq/cm^2/hr for the 5% and 10% CO_2 solutions, resp. Secretory lag (time between readmission of O_2 after a 20 min anaerobic period, and the rise of the secretory rate to 50% of the maximum) was 6.56 and 8.44 min for the 5% and 10% solutions, resp. Potential differences were 22.2 and 31.5 mV, resp. Secretory overshoot (ratio of peak secretory rate on reoxygenation to the steady-state rate during the following hr) was 125% and 105% of steady state, resp. All differences were statistically significant. Tissues subjected to 1 hr of anoxia during preparation showed an unexpected sudden potential drop (11 to -1 mV in 1 min) when exposed to the 10% solution; a normal potential decrease to 7.3 mV in 1 min occurred with the 5% solution. For 21 tissues, after 1 hr of anoxia the sudden potential drop occurred 35.0 min after anoxia for 14-58 min at 8.2 mV. On reoxygenation, the potential difference rose at 7.0 min and the secretory lag was 21.7 min. It is concluded that removal of CO_2 as a limiting factor by using a 10% concentration has effects on parameters other than acid secretion, including a sudden potential drop completely new to these conditions.

2455 REDUCTION OF CALCIUM ABSORPTION DUE TO DIVERSE INHIBITORS OF ALKALINE PHOSPHOMONOESTERASE. *(Fr.)* Fournier, P.; Dupuis, Y.; Digaud, A.; Fournier, A. (Fac. Pharm. Biol. Sci. Chatenay-Malabry, France). *C. R. Acad. Sci.* [*D*] *(Paris)* 279(6): 497-500, 1974.

After an overnight fast, male Wistar rats were given 2ml of various calcium solutions containing 0.1 µCi of ^{45}Ca/ml p.o. through a stomach tube. Plasma radioactivity was measured after 3 hr, and the animals were sacrificed after 5 or 24 hr. The ^{45}Ca content of a femur, digestive contents and feces (collected from the start of the experiment) was determined. Absorption and retention values for calcium gluconate solutions were up to 5 times higher than for calcium glycerophosphates, while calcium chloride values fell in between. The glycerol portion of the glycerophosphates had no effect on calcium absorption, but the phosphate moiety inhibited absorption in proportion to the amount of phosphate present. It is proposed that alkaline phosphatase acts as a calcium-binding protein whose effect is inhibited in the presence of phosphate ions and enhanced in the presence of sugars.

2456 FUNCTION AND STRUCTURE OF THE MUCOSA OF CONTINENT ILEOSTOMY RESERVOIRS IN DOGS. *(E.)* Philipson, B.; Kock, N. G.; Robinson, J. W. L.; Menge, H.; Mirkovitch, V. (Sahlgrenska Hosp., Univ. Goteborg, Sweden). *Gut* 16(2):132-136, 1975.

Morphological changes and absorptive capacity were studied in continent ileostomy reservoirs in the dog. Nineteen mongrel dogs had the ileum divided about 7 cm from the ileocecal valve, and the distal stump closed. A loop of ileum was constructed into a pouch, fixed in the abdomen, and the outlet passed through the abdominal wall to create an ileostomy. A catheter was inserted before closure for volume registration and drainage. After 3-4 days the permanent cahteter was removed and the reservoir emptied 3 times daily by insertion of a catheter. After 9-29 days the reservoir was emptied, its volume was determined by saline insufflation, and it was removed with 50 cm of proximal small intestine. Tissue samples were cut parallel to the villus/crypt axis, and fixed and stained. Samples of mucosa were also separated from the muscle and incubated for 1 hr in ^{14}C-labeled L-phenylalanine or β-methyl-D-glucoside, and other samples were incubated with ^{14}COOH-inulin to determine extracellular space. Oxygen consumption and acid phosphatase release were determined after incubation in Krebs phosphate buffer containing 2 mg/ml glucose. Of 19 dogs, 8 survived long enough for characteristic changes to occur in the reservoir. In these the mean volume of the reservoirs had increased by 280 ml. The villi were fingerlike and shorter than normal with occasional mosaic forms. Morphometric evaluations showed also an increase in villous width and a reduction in epithelial cell height. The mitotic index of the reservoir mucosa was 3.05 while that of the proximal intestine was 2.25, a significant difference. There was a significant reduction of phenylalanine and β-methyl glucoside transport in the mucosa of the pouch and the proximal intestine, but no significant difference between these 2 areas. Oxygen consumption and phosphatase release were both lower than control values, but the same for both reservoir and proximal intestine. Results suggest that the reservoir mucosa undergoes a hyperregenerative transformation from the exogenous stress of its contents, and the number of active absorbing cells is reduced.

2457 AN EXPERIMENTAL METHOD OF IDENTIFYING AND QUANTIFYING THE ACTIVE TRANSFER ELECTROGENIC COMPONENT FROM THE DIFFUSIVE COMPONENT DURING SUGAR ABSORPTION MEASURED IN VIVO.

(E.) Debnam, E. S.; Levin, R. J. (Dep. Physiol., Univ. Sheffield, England). *J. Physiol. (Lond.)* 246(1):181-196, 1975.

The kinetics of active sugar transport in the rat jejunum were measured *in vivo* using the traditional chemical techniques together with a new method utilizing the electrical potential difference generated across the intestine by the coupled movement of ions with the transport of sugars. Prewarmed solutions of bicarbonate saline containing increasing concentrations of glucose, galactose, or α-methyl glucoside were circulated through cannulated jejunal segments of pentobarbitone-anesthetized male rats. After circulating 15 min, the absorption of sugar by the gut was determined. Sugar absorption estimated by chemical methods exhibited two components: one was phlorhizin-sensitive, saturable, and generated electrical potential differences (electrogenic active component); the other was phlorhizin-insensitive, nonsaturable, and did not generate electrical potentials (diffusive component). The diffusive component of the actively transported sugars was identical to the absorption behavior of sorbose, a hexose which is not actively transferred. A method was developed for correcting the data obtained from chemical absorption studies for the diffusive component. The corrected, operational kinetic constants for apparent K_m, obtained by this method were not significantly different from values obtained electrically. The identity between the values obtained by the two methods supports the concept that they represent a measure of the same rate-limiting step in the absorption process. The electrical method for obtaining apparent K_m appears to offer a simple, relatively rapid method of obtaining major operational kinetic parameters of the active intestinal electrogenic absorption process; the technique can also be used with amino acids.

2458 URINARY EXCRETION OF 5-METHYLTETRAHYDROFOLATE AND LIVER S-ADENOSYLMETHIONINE LEVELS OF RATS FED A VITAMIN B_{12}-DEFICIENT DIET.

(E.) Vidal, A. J.; Stokstad, E. L. R. (Dep. Nutr. Sci., Univ. California, Berkeley). *Biochim. Biophys. Acta* 362(2):245-257, 1974.

The effect of ethionine and methionine on the uptake and urinary excretion of tritiated folic acid was studied, along with the effect of methionine and vitamin B_{12} on the liver concentration of S-adrenoxyl-methionine. Weanling male Sprague-Dawley rats were maintained on a basal diet deficient in vitamin B_{12} and containing only a 0.2% methionine. Supplemental D,L-methionine (15 g/kg) and vitamin B_{12} (100 μg/kg) were included in the diet, and supplemental D,L-ethionine (12.5 mg) was injected i.p. Tritiated folic acid (30 μCi) was injected i.p. and 24 hr later the folate derivatives in the liver were determined by DEAE-cellulose and sephadex chromatography. The uptake of radioactivity by the liver was depressed in the animals fed the basal diet. The uptake returned to control values when methionine, ethionine, and/or B_{12} were given as supplements; the increased uptake occurred primarily in the polyglutamate fractions. The basal diet also caused an increase in the excretion of radioactivity in the urine; in these animals, 5-methyltetrahydrofolate represented 65% of the total urinary radioactivity, while 10-formyltetrahydrofolate plus 5-formyltetrahydrofolate represented 19%. B_{12}, methionine, and/or ethionine supplementation normalized these levels to about 45% and 39%, resp. Rats fed the basal diet showed a significant decrease (to approximately 33 nM/g wet tissue) in hepatic S-adenosylmethionine. Dietary supplementation with methionine and/or B_{12} returned the levels to a normal 60 nM/g. Perfusion of the deficient liver with 300 μM of L-methionine for 1 hr increased the levels to approximately 115 nM/g. The effect of methionine appears to be direct, while that of B_{12} is mediated *via* the *de novo* synthesis of methionine. The results support the "methyl-block" hypothesis, which holds that in a primary cobalamin deficiency, folate may be trapped as N-5-methyltetrahydrofolic acid due to a partial block in the methylation of homocysteine and an essentially irreversible N-5-methyltetrahydrofolic acid reductase reaction.

2459 THE DIFFERENCE IN THE CLEARANCE OF INTERSTITIAL ALBUMIN BY THE LYMPHATICS FROM THE STOMACH AND THE SMALL AND LARGE INTESTINE.

(E.) Sheppard, M. S.; Sterns, E. E. (Dep. Surg., Queen's

Univ., Kingston, Canada). *Surg. Gynecol. Obstet.* 140(3):405-408, 1975.

The ability of the lymphatics to clear interstitial protein from the stomach, mid-portion of the small intestine, and colon was studied. Radioiodinated serum albumin (0.05 ml) was injected into the stomach, small intestine, and colon of pentobarbital-anesthetized dogs. Thoracic duct lymph was collected over the following 5 hr, and portal and vena caval blood samples were drawn intermittently during the same period; saline, equal in volume to the blood and lymph removed, was infused i.v. During the 5-hr experimental period, about 9% of the interstitially injected albumin was returned by the thoracic duct lymph; 98 min were required for 0.1% of the injected dose to appear in the lymph. Immediately after albumin injection, 1.1% of the injected dose appeared in the blood; this increased to 2.3% after 5 hr. Residual activity at the site of injection was 44%. Similar results were obtained after the injection of albumin into the colon. Significantly more of the injected activity was recovered from the thoracic duct lymph after injection into the small intestine (37%) than after injection into the stomach or colon. The time required for 0.1% of the dose to appear in the lymph (13 min) was also significantly lower after injection into the small intestine. The initial and final blood values (3.6% and 6.3%) were higher after small intestinal injection, and significantly less radioactivity remained at the site of injection (8.6%). The results suggest that the small intestine clears interstitial albumin more rapidly and effectively than the large intestine and stomach and that the colonic and gastric lymphatics behave similarly to each other and significantly differently from those of the small intestine with regard to the transport of interstitial albumin.

2460 STUDIES ON A WIDE-SPECTRUM INTESTINAL DIPEPTIDE UPTAKE SYSTEM IN THE MONKEY AND IN THE HUMAN.

(E.) Das, M.; Radhakrishnan, A. N. (Christian Med. Coll. Hosp., Vellore, India). *(Biochem. J.* 146(1):133-139, 1975.

The intestinal transport of glycine and leucine residues of glycyl-L-leucine was studied in the monkey and in the human *in vitro*. The region of the monkey intestine at 35-40% distance of the total length of intestine from the pyloric end was used in all experiments. The human intestinal specimen (7.6 cm long) was resected from the jejunal region of a patient undergoing corrective surgery for complications arising after a gastroenterostomy. Each intestinal strip (10-20 mg) was preincubated at the same temperature as the incubation step in 2 ml of oxygenated Krebs-Ringer bicarbonate buffer, containing 0.5% glucose. The medium was then aspirated, fresh medium containing the peptide solution was added, and the mixture incubated for 2 min at 37 C. Radioactivity was measured in a liquid-scintillation counter. Uptake of both [^{14}C]glycyl-L-leucine and glycyl-L-[^{14}C]-leucine showed similar K_t values, but there was a marked difference in the maximal uptake rate (V_{max}) values. This difference in the V_{max} values may be due to the greater efflux rate of glycine from the tissue. Arrhenius plots of both [^{14}C]glycyl-L-leucine uptake and glycyl-L-[^{14}C]leucine uptake in the monkey intestine showed a discontinuity at about 20 C. The activation energies above and below the discontinuity are similar for both [^{14}C]glycyl-L-leucine uptake and glycyl-L-[^{14}C]leucine uptake. These similarities suggest that the dipeptide glycyl-L-leucine is transported as one unit. In the monkey intestine, glycyl-L-leucine uptake was inhibited by a wide variety of dipeptides, including those containing acidic and basic amino acids. The inhibition was shown to be competitive by using 4 representative dipeptides: L-alanyl-L-alanine, L-alanyl-L-leucine, L-glutamyl-L-glutamic acid and L-lysyl-L-lysine. The results suggest that in the monkey intestine there may be a dipeptide uptake system with an extremely broad specificity. The specificity of glycyl-L-[^{14}C]leucine uptake in the human intestine was studied in a very limited way. All 5 dipeptides tested were inhibitory. L-Alanyl-L-leucine and L-lysyl-L-phenylalanine were strong inhibitors, whereas L-glutamyl-L-glutamic acid, glycyl-L-proline and L-prolyl-glycine were less potent inhibitors. The results suggest that the specificity of dipeptide uptake in the human may be very similar to that in the monkey.

2461 SMALL INTESTINAL MALABSORPTION OF VITAMIN B_{12} IN IRON-DEFICIENT RATS.

(E.) Yeomans, N. D.; St. John, D. J. B. (Monash Univ. Dep. Med., Melbourne, Australia). *Pathology* 7(1):35-44, 1975.

The mechanism of vitamin B_{12} malabsorption in iron deficiency was studied in female Sprague-Dawley rats. Weanling rats were maintained on an iron-deficient diet and bled at weekly intervals to speed the development of iron deficiency. Control rats were fed the iron-deficient diet supplemented with ferrous iron and some of the iron-deficient rats were repleted with parenteral iron before measurement of B_{12} absorption. B_{12} absorption was determined by isolating small intestinal loops *in vivo* and measuring the absorption of ^{57}co-vitamin B_{12} bound to a known quantity of intrinsic factor in the gastric juice. The mean corpuscular hemoglobin concentration was significantly reduced in the iron-deficient rats and no stainable iron was present in their livers. In these animals, the intestinal uptake and transport of B_{12} were significantly below control values; intestinal uptake and transport were to some extent interdependent. In the iron-deficient rats repleted with iron, the uptake and transport of B_{12} were normal within 3 days; at this time, the mean hemoglobin concentration had increased significantly and iron had reappeared in the hepatocytes and was present in Kupffer cells in supra-normal amounts. There was no correlation between hemoglobin level and B_{12} absorption, although there was a significant inverse relationship between hemoglobin level and ^{57}Co-B_{12} incorporation into the liver. Basal intrinsic factor secretion did not differ in the iron-deficient and control rats, and there was no significant difference in bacterial counts in the intestinal washings or small intestinal histology. Cecal enlargement, due primarily to increased cecal contents, was noted in all iron-deficient and none of the iron-supplemented rats. The results indicate that malabsorption of B_{12} in iron deficiency occurs as a result of an abnormality in the intestinal phase of absorption and is unrelated to any possible effect of iron deficiency on the stomach.

2462 METABOLISM OF IRON BY RATS FED WHEAT DIETS SUPPLEMENTED WITH LYSINE AND METHIONINE. *(E.)* Miller, J. (Univ. Georgia Coll. Agric. Exp. Stn., Georgia Stn., Experiment). *Nutr. Rep. Int.* 10(1):1-8, 1974.

The effect of the protein quality of bread on the absorption of iron from the bread was studied. Weanling Sprague-Dawley rats were maintained for 6 weeks on gluten (20%) or raw white wheat flour (88.8% enriched white wheat flour) diets supplemented with 0, 0.25, or 0.5% l-lysine HCl or 0.45% lysine plus 0.2% l-methionine. After 6 weeks, the animals were exsanquinated and their hematological status assessed. The animals fed the 20% gluten diet grew slowly; supplementation of the diet with lysine brought about a marked improvement in growth rate and feed efficiency which were directly related to the amount of lysine added. The rats fed the unsupplemented flour diet also gained weight slowly, but grew at a greater rate than those fed the unsupplemented gluten diet. The addition of lysine to the flour diet more than doubled the growth rate with no increase in food intake; the further addition of methionine resulted in reduced food intake with no change in growth rate. However, even with the addition of both lysine and methionine, the growth rate was only about 1/2 that expected of animals fed balanced diets. The addition of lysine to either diet increased the total iron content in the spleen and carcass, but had little effect on the iron content of the liver. The concentration of iron in the livers of the flour-fed rats was unusually high compared with rats fed a balanced diet. Amino acid supplementation of both diets increased the blood hematocrit and the blood hemoglobin concentration. In the flour-fed animals, lysine also increased the average volume/cell and the quantity of hemoglobin/cell, but lowered the serum iron content. In the gluten-fed rats, lysine increased the serum binding capacity. Osmotic fragility of the RBC was not affected by diet. The results indicated that the low protein quality of the 2 diets resulted in a relatively greater diminution in the synthesis of hemoglobin compared with other proteins associated with growth; as a result, an excessive amount of the absorbed iron was transferred to storage compartments such as the liver and bone marrow.

2463 IN VIVO D-GLUCOSE ABSORPTION IN THE DEVELOPING RAT SMALL INTESTINE. *(E.)* Younoszai, M. K.; Lynch, A. (Coll. Med., Univ. Iowa, Iowa City). *Pediatr Res* 9(3):130-133, 1975.

The rates of D-glucose absorption in the small intestine of rats of various ages were measured *in vivo* using a one-pass perfusion technique. Solutions of D-glucose (1-20 mg/ml) were perfused *in situ* through the jejunum and ileum of anesthetized Holtzman rats aged 7-8, 14-15 (suckling), 21-23 (weanling), 35-36, or 70-73 days. The amounts of glucose absorbed expressed as percentage of load perfused (normalized for intestinal weight, mg/hr/g wet weight) were greater in the weanling than in suckling pups. The rate of glucose absorption increased with increasing glucose concentration in the perfusion solutions and reached a plateau when the concentration exceeded 3 mg/ml in the suckling and 10 mg/ml in the weanling rats. Based on intestinal weight, absorption rates (mg/hr/gm wet weight) from solutions containing 10 mg/ml glucose were 2-fold higher in the 21- to 23-day-old rats than in the 7- to 8-day-old pups. Glucose absorption rates (mg/hr/g wet weight of the perfused intestine) from the 20 mg/ml solution were similar in rats aged 21-23 (64), 35-36 (60), and 70-73 (58) days; however, when based on length of intestinal segments, absorption rates were significantly greater in the older rats. The data suggest that in rats the ability of the small intestine to absorb glucose/unit weight about doubles at the time of weaning as compared with the suckling period, with no further enhancement thereafter. They further suggest that the same stimulus which increases small intestinal sucrase activity also brings about changes in the glucose transporting mechanism.

2464 EFFECT OF ASPIRIN, ANTACID, AND ALCOHOL ON THE POTENTIAL DIFFERENCE IN THE HUMAN STOMACH. *(Ger.)* Caspary, W. F. (Med. Clin., Univ. Gottingen, Germany). *Z. Gastroenterol.* 12(Suppl.): 419, 1974.

2465 THE EFFECT OF TEA ON IRON ABSORPTION. *(E.)* Disler, P. B.; Lynch, S. R.; Charlton, R. W.; Torrance, J. D.; Bothwell, T. H.; Walker, R. B.; Mayet, F. (Iron Red Cell Metab. Unit, South African Med. Res. Counc., Johannesburg). *Gut* 16(3):193-200, 1975.

2466 INHIBITION OF INTESTINAL BILE ACID ABSORPTION BY BIGUANIDES. *(Ger.)* Caspary, W. F.; Lucke, H.; Creutzfeldt, W. (Med. Clin., Univ. Gottingen, Germany). *Z. Gastroenterol.* 12(Suppl.): 423, 1974.

2467 THE EFFECT OF PRENYLAMINE (SEGONTIN) ON SMALL INTESTINE ABSORPTION IN MAN. *(Ger.)* Gottesburen, H.; Raida, H.; Riecken, E. O. (Med. Clin., Univ. Marburg/Lahn, Germany). *Z. Gastroenterol.* 12(Suppl.):426, 1974.

2468 ABSORPTION OF MORPHINE, BUTYLSCOPOLAMINE, MECAMYLAMINE AND PHENOBARBITONE FROM THE SMALL INTESTINE OF THE TRIPARANOL-TREATED RAT IN SITU. *(E.)* Venho, V. M. K. (Dep. Pharmacol., Univ. Helsinki, Finland). *Arzneim. Forsch.* 25(2): 232-234, 1975.

2469 THE EFFECT OF PENTAGASTRIN AND GLUCAGON ON WATER, ELECTROLYTE, AND GLUCOSE ABSORPTION IN THE HUMAN JEJUNUM. *(Ger.)* Ewe, K.; Laubenthal, G.; Hoditz, U. (1st Med. Clin. Polyclin., Univ. Mainz, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:845-847, 1973.

2470 INTESTINAL TRANSPORT OF GLUCOSE, AMINO ACIDS AND ELECTROLYTES IN LEAD POISONING. *(E.)* Wapnir, R. A.; Exeni, R. A.; McVicar, M.; Lifshitz, F. (North Shore Univ. Hosp., Manhasset, N.Y.). *Fed. Proc.* 34(3):917, 1975.

2471 ENTERIC MICROFLORA EFFECTS ON INTESTINAL TRANSPORT OF CARBOHYDRATES. *(E.)* Lifshitz, F.; Wapnir, R. A.; Wehman, H. J.; Hawkins, R. L.; Diaz-Bensussen, S. (North Shore Univ. Hosp., Manhasset, N.Y.). *Fed. Proc.* 33(3):673, 1974.

2472 EFFECT OF SINGLE AND COMBINED INFUSIONS OF ANGIOTENSIN II AND ALDOSTERONE ON COLONIC POTENTIAL DIFFERENCE, BLOOD PRESSURE AND RENAL FUNCTION, IN PATIENTS WITH ADRENAL DEFICIENCY. *(E.)* Efstratopoulos, A. D.; Peart, W. S. (St. Mary's Hosp. Med. Sch., London, England). *Clin. Sci. Mol. Med.* 48(3):219-226, 1975.

2473 KINETICS OF GLYCEROL UPTAKE BY THE PERFUSED RAT LIVER. MEMBRANE TRANSPORT, PHOSPHORYLATION AND EFFECT ON NAD REDOX LEVEL. *(E.)* Sestoft, L.; Fleron, P. (Dep. Biochem. A, Univ. Copenhagen, Denmark). *Biochim. Biophys. Acta* 375 (3):462-471, 1975.

2474 INTESTINAL ABSORPTION AND ELECTROLYTE ABSORPTION. *(E.)* Gurll, N. J.; Zinner, M. J. (Div. Surg., Walter Reed Army Inst. Res., Washington, D.C.). *Am. Surg.* 41(4):189-192, 1975.

2475 ALTERATIONS IN MEMBRANE SURFACE PROPERTIES DURING CELL DIFFERENTIATION AS MEASURED BY PARTITION IN AQUEOUS TWO-POLYMER PHASE SYSTEMS. RAT INTESTINAL EPITHELIAL CELLS. *(E.)* Walter, H.; Krob, E. J. (VA Hosp., Long Beach, Calif.). *Exp. Cell Res.* 91(1):6-14, 1975.

2476 USE OF THE UNANESTHETIZED RHESUS MONKEY AS A MODEL FOR STUDYING THE GASTROINTESTINAL ABSORPTION OF DRUGS. *(E.)* Nayak, R. K.; Benet, L. Z. (Dep. Pharm., Univ. California, San Francisco). *J. Pharmacokinet. Biopharm.* 2(5):417-431, 1974.

2477 DRUG ABSORPTION VII: INFLUENCING OF MESENTERIC BLOOD FLOW ON INTESTINAL DRUG ABSORPTION IN DOGS. *(E.)* Crouthamel, W. G.; Diamond, L.; Dittert, L. W.; Doluisio, J. T. (Coll. Pharm., Univ. Kentucky, Lexington). *J. Pharm. Sci.* 64(4): 664-671, 1975.

2478 INFLUENCE OF ENVIRONMENTAL TEMPERATURE ON INTESTINAL ABSORPTION OF XYLOSE IN RATS IN VIVO. *(E.)* Ciampolini, M. (Inst. Clin. Pediatr., Univ. Florence, Italy). *J. Int. Res. Commun.* 2(9): 1545, 1974.

2479 MECHANISM FOR OXALIC ACID ABSORPTION IN THE SMALL AND LARGE INTESTINES. *(Ger.)* Caspary, W. F.; Balfanz, A.; Windemuth, H. (Med. Clin., Univ. Gottingen, Germany). *Z. Gastroenterol.* 12(Suppl.):424, 1974.

2480 ENHANCEMENT OF INTESTINAL ABSORPTION OF ETHANOL BY AMINO ACIDS. *(E.)* Broitman, S. A.; Vitale, J. J.; Gottlieb, L. S. (Mallory Inst. Pathol., Boston, Mass.). *Am. J. Clin. Nutr.* 28(4):419, 1975.

2481 EFFECT OF VARIOUS ALCOHOLS ON INTESTINAL NET WATER FLUX AND THEOPHYLLINE ABSORPTION IN RATS. *(E.)* Houston, J. B.; Levy, G. (Sch. Pharm., State Univ. New York, Buffalo). *J. Pharm. Sci.* 64(4): 607-610, 1975.

2482 CALCIUM ABSORPTION AND BALANCES DURING HIGH PHOSPHORUS INTAKE IN MAN. *(E.)* Spencer, H.; Kramer, L.; Norris, C. (VA Hosp., Hines, Ill.). *Fed. Proc.* 34(3):888, 1975.

2483 SEX AND CALCIUM TRANSPORT THROUGH THE DUODENAL WALL OF RATS. *(E.)* Gruden, N.; Buben, M. (Inst. Med. Res., Yugoslav Acad. Sci. Arts, Zagreb). *Experientia* 31(2):198-199, 1975.

2484 EFFECTS OF THE ULTIMOBRANCHIAL AND PARATHYROID GLANDS AND VITAMINS D_2, D_3 AND DIHYDROTACHYSTEROL ON BLOOD CALCIUM AND INTESTINAL CALCIUM TRANSPORT IN THE FROG. *(E.)* Robertson, D. R. (Upstate Med. Cent., Syracuse, N.Y.). *Endocrinology* 9(4):934-940, 1975.

2485 STUDIES ON THE MECHANISM OF ACTION OF CALCIFEROL. VIII. THE EFFECTS OF DIETARY VITAMIN D AND THE POLYENE ANTIBIOTIC, FILIPIN, IN VITRO, ON THE INTESTINAL CELLULAR UPTAKE OF CALCIUM. *(E.)* Wong, R. G.; Norman, A. W. (Dep. Biochem., Univ. California, Riverside). *J. Biol. Chem.* 250(7):2411-2419, 1975.

2486 INTESTINAL CALCIUM BINDING PROTEIN (CaBP) - QUANTITATIVE INDEX OF VITAMIN D DEFICIENCY. *(E.)* Bronner, F.; Freund, T. S. (Univ. Connecticut Health Cent., Farmington). *Am. J. Clin. Nutr.* 28(4): 428, 1975.

2487 THE EFFECT OF LACTOSE ON IN VIVO CALCIUM TRANSPORT IN THE RAT. *(E.)* Urban, E.; Pena, M. (Univ. Texas Health Sci. Cent., San Antonio). *Am. J. Clin. Nutr.* 28(4):431, 1975.

2488 HORMONES AND THE STIMULATED SODIUM TRANSPORT IN CECUM HYPERTROPHY. *(E.)* Loeschke, K.; Muller, O. A. (Univ. Med. Clin. II, Munich, Germany). *Pfluegers Arch.* 355(3):273-280, 1975.

2489 EFFECT OF CHOLERA TOXIN ON Na TRANSPORT BY EPITHELIAL CELLS IN THE RABBIT ILEUM. *(Fr.)* Desjeux, J. F.; Curran, P. F. (Herold Hosp., Paris, France). *Biol. Gastroenterol. (Paris)* 7(4): 308, 1974.

2490 EFFECT OF DIFFUSION FORCES ON SODIUM TRANSPORT THROUGH THE RABBIT ILEUM. *(Fr.)* Desjeux, J. F.; Curran, P. F. (Herold Hosp., Paris, France). *Biol. Gastroenterol. (Paris)* 7(4):307-308, 1974.

2491 GLUCOSE TRANSPORT ACROSS THE SMALL INTESTINE OF PARENTERALLY NOURISHED RATS. *(E.)* Schanbacher, L. M.; Johnson, L. R.; Copeland, E. M.; Dudrick, S. J.; Castro, G. A. (Univ. Texas Med. Sch., Houston). *J. Int. Res. Commun.* 2(7):1459, 1974.

2492 EFFECT OF GLUCOSE ABSORPTION ON POTASSIUM TRANSPORT IN THE HUMAN JEJUNUM. *(Fr.)* Bernier, J. J.; Modigliani, R.; Matuchansky, C.; Rambaud, J. C. (St. Lazare Hosp., Paris, France). *Biol. Gastroenterol. (Paris)* 7(4):309, 1974.

2493 BIOAVAILABILITY OF TRIVALENT IRON IN ORAL IRON PREPARATIONS. THERAPEUTIC EFFICACY AND IRON ABSORPTION FROM SIMPLE FERRIC COMPOUNDS AND HIGH-OR-LOW-MOLECULAR WEIGHT FERRIC HYDROXIDE-CARBOHYDRATE COMPLEXES. *(E.)* Heinrich, H. C. (Univ. Hosp. Eppendorf, Univ. Hamburg, Germany). *Arzneim. Forsch.* 25(3):420-426, 1975.

2494 EFFECT OF MEALS AND ASCORBIC ACID ON THE ABSORPTION OF A THERAPEUTIC DOSE OF IRON AS FERROUS AND FERRIC SALTS. *(E.)* Grebe, G.; Martinez-Torres, C.; Layrisse, M. (Dep. Exp. Med., Venezuelan Inst. Sci. Invest., Caracas). *Curr. Ther. Res.* 17(4):382-397, 1975.

2495 RELATION OF MONOSACCHARIDE ABSORPTION IN THE RAT TO GNOTOBIOTIC STATUS, ANTIBIOTIC THERAPY, AND CYTOSTATIC THERAPY. *(Ger.)* Bohmer, R.; Binder, R.; Rommel, K. (Dep. Clin. Chem., Univ. Ulm, Germany). *Z. Gastroenterol.* 12(Suppl.):427, 1974.

2496 SPONTANEOUS DISSOLUTION OF DIPEPTIDASE FROM THE SURFACE OF INTACT INTESTINAL MUCOSA. *(Rus.)* Ugolev, A. M.; Timofeieva, L. F. (I. P. Pavlov Inst. Physiol., Leningrad, USSR). *Dok. Adad. Nauk SSSR* 221(4):984-988, 1975.

2497 BILIARY ELIMINATION KINETICS OF TRITIUM WATER, SODIUM-22, C-14 UREA, C-14 CREATININE, BROMSULPHTHALEIN AND H-3-OUABAIN INJECTED INTO THE PORTAL VEIN OF RATS. *(E.)* Osswald, H.; Auer, F. (Dep. Pharmacol., Rhenish-Westphal. Tech. Coll., Aachen, Germany). *Nauyn Schmiedebergs Arch. Pharmacol.* 282(Suppl.):R 72, 1974.

2498 TRANSCELLULAR ION ROUTE IN RABBIT GALLBLADDER. ELECTRIC PROPERTIES OF THE EPITHELIAL CELLS. *(E.)* Henin, S.; Cremaschi, D. (Inst. Gen. Physiol., Univ. Milan, Italy). *Pfluegers Arch.* 355(2):125-139, 1975.

2499 LYMPHATIC TRANSPORT OF BILE MARKERS VIA THE BLOOD DURING EXPERIMENTAL BILIARY OBSTRUCTION. *(Fr.)* Prandi, D.; Dumont, M.; Duval, M.; Erlinger, S. (Beaujon Hosp., Clichy, France). *Biol. Gastroenterol. (Paris)* 7(4):326-327, 1974.

2500 EXCRETION OF CREATININE INTO GASTROINTESTINAL TRACT IN RENAL-ARTERY-LIGATED RATS. *(E.)* Terato, K.; Yamakawa, S.; Yoshino, Y. (Eisai Res. Lab., Tokyo, Japan). *Chem. Pharm. Bull. (Tokyo)* 23(1):237-239, 1975.

See also, 2598, 2790, 2817, 3223, 3294, 3678.

MOTILITY

2501 INHIBITORY ACTIONS OF LAXATIVES ON MOTILITY AND WATER AND ELECTROLYTE TRANSPORT IN THE GASTROINTESTINAL TRACT. *(E.)* Stewart, J. J.; Gaginella, T. S.; Olsen, W. A.; Bass, P. (Cent. Health Sci., Univ. Wisconsin, Madison). *J. Pharmacol. Exp. Ther.* 192(2):458-467, 1975.

The effects of an irritant (castor oil) and an osmotic (magnesium sulfate) diuretic on gastrointestinal motility and water and electrolyte transport were compared in 6 healthy dogs. Circular smooth muscle activity was monitored by extraluminal strain gauge transducers at different sites along the gastrointestinal tract following gastric intubation of 45 ml of water and castor oil or a 30% solution of magnesium sulfate, after feeding or 20 hr fasting. Decreases in total activity were found for both cathartics in the antrum and ileum. Further analysis revealed that decreases in the ileum occurred primarily due to a decrease in contractile rate, whereas antral decreases could be attributed primarily to a decrease in force/contraction. Proximal colonic activity tended to decrease after laxatives and feeding. The effects of ricinoleic acid, isotonic and hypertonic solutions of magnesium sulfate and mannitol on net water and electrolyte absorption were tested on everted segments of hamster jejunum. Sodium ricinoleate (2.0 mM) reduced net water transport by 48%. Magnesium sulfate, like mannitol, only reduced net water absorption when present as a component of a hypertonic mucosal solution. The results suggest that both inhibition of water absorption and reduced circular smooth muscle activity may be important factors in castor oil- and magnesium sulfate-induced catharsis.

2502 THE VOLUME AND ENERGY CONTENT OF MEALS AS DETERMINANTS OF GASTRIC EMPTYING. *(E.)*

Hunt, J. N.; Stubbs, D. F. (Guy's Hosp. Med. Sch., London, England). *J. Physiol. (Lond.)* 245(1):209-225, 1975.

Information from 33 published and unpublished studies of gastric emptying was used to determine quantitative relations between nutritive density of meals and emptying behavior of the stomach. Calculations were based upon gastric emptying of food during the first 60 min of the emptying process, volumes of meals 50-1250 ml, and varied composition with nutritive densities of 0-2.3 kcal/ml. The greater the density of the meal, the lesser was the volume transferred to the duodenum (independent of initial volume), but the rate of delivery of energy to the duodenum (nutritive density times volume delivered) was not affected. Based upon the interaction of stimulus (kcal/ml) and duodenal receptors it was possible to predict the rate of gastric emptying, given the nutritive density of the meal. Dietary carbohydrates and triglycerides added to test meals slowed gastric emptying (higher concentration, slower emptying) due to intraduodenal concentration of digestion products (monosaccharides or salts of fatty acids). It is concluded that isocaloric amounts of fat, protein and carbohydrate (e.g. 4 g fat, 9 g carbohydrate) result in equal slowing of gastric emptying.

2503 RATE OF GASTRIC EMPTYING OF PHENOL RED IN A RABBIT. *(E.)*

Goto, S.; Yamagata, T.; Tsuzuki, O.; Iguchi, S. (Fac. Pharm. Sci., Okayama Univ., Japan). *Chem. Pharm. Bull. (Tokyo)* 21(11): 2495-2499, 1974.

The gastric emptying of phenol red both alone and with the simultaneous administration of aminopyrine and caffeine was studied quantitatively in male rabbits. After a series of 5 washings of the rabbit stomach with warm water *via* a vinyl tube, 100 ml isotonic solution containing phenol red alone or phenol red and one of the drugs was instilled into the stomach during 1 min. The vinyl tube was removed and reinserted after a specified time for removal of the gastric content by gentle aspiration with a syringe. Twelve rabbits were used in the experiment with phenol red alone; the tests were performed at weekly intervals with the same rabbit. For the first 2 months the gastric emptying behavior was almost always reproducible, but there was some variation after 3 months. The gastric emptying pattern, 75 min after p.o. administration, showed the percent of residual phenol red in the rabbits at the initiation of the experiment to range from 16.5 to 25.5%, whereas after 3 months the range of values was 4.1 to 7.0%. Corresponding ranges for the residual total volume were 33 to 41 ml and 13 to 16 ml, resp. Gastric emptying and the volume of gastric content were governed by first-order kinetics in the case of phenol red alone. The simultaneous administration of aminopyrine (900 mg) caused a smaller exponential decline in the amount of phenol red than was found when phenol red was administered alone. Caffeine (50, 200, and 300 mg) produced no such effect. These results support the previously reported hypothesis that aminopyrine suppresses the transfer of phenol red to the duodenum and that simultaneously administered drugs such as caffeine, which have no effect on the gastric emptying of phenol red, can eliminate the effect of aminopyrine and reduce its gastric emptying time.

2504 INTESTINAL SMOOTH MUSCLE ELECTRICAL POTENTIALS RECORDED FROM SURFACE ELECTRODES. *(E.)*

Brown, B. H.; Smallwood, R. H.; Duthie, H. L.; Stoddard, C. J. (Weston Park Hosp., Sheffield, England). *Med. Biol. Eng.* 13(3):97-103, 1975.

The source of electrical signals recorded from the human small intestine using surface electrodes was studied. Electrodes were placed on the trunks of 16 normal subjects, 3 pairs over the gastroduodenal area and a 4th pair placed across the chest and used to record respiration. Recordings were made after fasting and immediately following a meal. Fourier analysis and correlation methods were used to analyze the data. A significant frequency component at approximately 3 cycles/min (average 3.02 min) was found in 88% of the stretches of record analyzed. It is unlikely that the signals were an electrode artifact or that they were the result of mechanical artifacts from the gut. Evidence indicates that the signal arose from the basic electrical rhythm of the stomach. In 28% of the recordings, consistent activity was found at a frequency of 10-12 cycles/min (average 10.8 cycles/min); this activity was found almost exclusively in the records made in the fasting state. Although this activity is near respiratory frequencies, simultaneous monitoring of respiration enabled the waveforms to be separated. The source of these rhythms is probably either the small or large bowel.

2505 INFLUENCE OF THE HORMONE ANALOGUE 13-NLE-MOTILIN AND OF 1-METHYL-3-ISOBUTYLXANTHINE

ON TONE AND CYCLIC 3'5'-AMP CONTENT OF ANTRAL AND DUODENAL MUSCLES IN THE RABBIT. *(E.)* Schubert, E.; Mitznegg, P.; Strunz, U.; Domschke, W.; Domschke, S.; Wunsch, E.; Jaeger, E.; Demling, L.; Heim, F. (Dep. Pharmacol., Univ. Erlangen-Nuremberg, Erlangen, Germany). *Life Sci.* 16(2):263-272, 1975.

To investigate whether changes in the cyclic AMP content lead to changes in smooth muscle tone and whether tone enhancement by acetylcholine and 13-norleucine-motilin is antagonized by an increase in endogenous cyclic AMP, the influence of 1-methyl-3-isobutylxanthine (isobutyltheophylline), norleucine-motilin, and acetylcholine on muscle tone and the content of cyclic AMP was studied. The cyclic AMP content of mucosa-free preparations of rabbit antral and duodenal muscles was increased 72% and 126%, resp., by isobutyltheophylline (2-3 x 10^{-4} M). 13-Norleucine-motilin (1.8 x 10^{-7} M), an analogue of the duodenal tissue hormone motilin, and acetylcholine (1.8 x 10^{-6} M) had no effect on the cyclic AMP content of the antral and duodenal muscles when given alone or in combination with isobutyltheophylline. In contrast, norleucine-motilin (1.8 x 10^{-7}) increased and isobutyltheophylline (3 x 10^{-4} M) decreased smooth muscle tone in the duodenum. The tone-enhancing effect of norleucine-motilin was reversed by the subsequent administration of isobutyltheophylline, whereas the muscle tone lowered by isobutyltheophylline was returned to its initial state by norleucine-motilin. The basic tone of the antral muscle was not reduced by isobutyltheophylline. However, pretreatment with isobutyltheophylline (2 x 10^{-4} M) significantly reduced (60%) the contraction-promoting effect of norleucine-motilin. It is assumed that changes in the tone or response of antral and duodenal muscles to norleucine-motilin administered after isobutyltheophylline are due to the increased tissue content of cyclic AMP. The antagonistic effects of cyclic AMP and motilin on the gastrointestinal muscles might be of physiological importance for the regulation of gastrointestinal motor activity.

2506 MANOMETRIC EVALUATION OF THE PAPILLA OF VATER. *(E.)* Nebel, O. T. (Nav. Reg. Med. Cent., San Diego, Calif.). *Gastrointest. Endosc.* 21 (3):126-128, 1975.

A new technique for manometry of the sphincter of Oddi is described. Preliminary studies were performed in five volunteers, and subsequent studies in 20 patients being evaluated for abdominal pain who were found to have no organic disease. The manometric catheter was 1.5 mm in diameter, 200 cm long, and the end of the tube was sealed, with a side hole 0.8 mm in diameter just behind the sealed portion. The proximal end had a standard i.v. fitting. During the measurements, the catheter was perfused with distilled water at 0.2 ml/min. Intraluminal pressure was transmitted through the catheter to an external transducer and recorded. Pressure for each min of measurement was calculated using duodenal pressure as zero reference. The catheter was inserted beyond the sphincter into the pancreatic duct or biliary tree, and slowly pulled through into the duodenum under direct endoscopic vision. Tests on the 5 volunteers demonstrated that the sedative diazepam (15 mg i.v.) caused no significant change in sphincter pressure, and this dose was used to sedate the 20 patients. Sphincter pressure in the 20 patients ranged from 18-45 mm Hg. The procedure was well tolerated by the patients and added only 15 min to normal duodenoscopy time. It is concluded that there is a high pressure area in the region of the papilla of Vater that can be measured by endoscopic manometric techniques.

2507 RESPONSE OF THE HUMAN CARDIAC SPHINCTER TO CIRCULATING PROSTAGLANDINS $F_{2\alpha}$ AND E_2 AND TO ANTI-INFLAMMATORY DRUGS. *(E.)* Dilawari, J. B.; Newman, A.; Poleo, J.; Misiewicz, J. J. (Cent. Middlesex Hosp., London, England). *Gut* 16(2):137-143, 1975.

The effects of i.v. prostaglandins $F_{2\alpha}$ and E_2 on motor responses of the gastroesophageal junction, and the effect of rectal indomethacin on cardiac sphincter pressure, were studied in 41 subjects. Three of the 41 were normal while 37 had upper abdominal complaints related to peptic ulceration or gastroesophageal reflux. Bolus injection of prostaglandin $F_{2\alpha}$ (2.5-40 μg/kg) had no effect on cardiac sphincter pressure, but i.v. infusion (0.05-0.8 μg/kg/min) for 20 min resulted in a marked increase of sphincter pressure from 10 min after the start to 15-20 min after the finish of infusion. Sphincteric relaxation during swallowing was prolonged, and this effect was significant in 4 subjects given 0.8 μg/kg/min. Neither esophageal peristalsis nor gastric fundic motility was significantly affected by prostaglandin $F_{2\alpha}$; plasma gastrin levels were unaltered. Although prostaglandin E_2 (0.1-0.08 μg/kg/min) had no effect on any variable of intraluminal pressure, i.v. infusion of 0.08 μg/kg/min inhibited sphincter contractions to serial bolus i.v. injections of pentagastrin (0.1 or 0.2 μg/kg) in 2 of 3 subjects. Rectal indomethacin (200 mg) resulted in a slow rise of cardiac sphincter pressure, suggesting that endogenous synthesis of an inhibitory (E-type) prostaglandin was suppressed. These results indicate that prostaglandin E_2 may be concerned in the regulation of cardiac sphincter tone in man, and that prostaglandin $F_{2\alpha}$ may be useful in the treatment of gastroesophageal reflux.

2508 DIETARY ORIGIN OF CIRCADIAN VARIATIONS IN THE ELECTRICAL ACTIVITY OF THE SMALL INTESTINE IN THE RAT. *(Fr.)* Ruckebusch, M.; Ferre, J. P. (Natl. Vet. Sch., Toulouse, France). *C. R. Soc. Biol.* (Paris) 167(12):2005-2009, 1974.

Jejunal electromyograms of Wistar rats show slow waves (frequency 30-36/min); 45% of these are followed by salvos of 3 to 20 potentials having amplitudes of 50-200 μV in rats fed *ad libitum.* The salvos may either occur very irregularly or in a segmentary manner after every slow wave for 2-3 min.

This type of activity is propagated at a rate of about 2 cm/min along the small intestine. Electrodes were placed at 4 cm intervals along the small intestine of Wistar rats, and the jejunal electromyogram was recorded. There were four groups of 10 rats each: 1) controls fed *ad libitum*; 2) those subjected to fasting with precautions taken to prevent coprophagy; 3) those subjected to fasting with no precautions taken to prevent coprophagy; and 4) those subjected to fasting and equipped with a gastric fistula. In group 1, about 60% of the slow waves were followed by irregular salvos during feeding. When rats stopped eating, about 30% of the slow waves were followed by segmentary salvos. In group 2, salvos followed about 30% of the slow waves and were segmentary after 5 to 6 hr of fasting. Irregular salvos persisted during part of the first 24 hr in group 3. In group 4, when the fistula was used to keep the stomach empty, the pattern of intestinal motility did not change significantly in fasting animals; there were two to three phases of segmentary salvos/hr. When the stomachs of these rats were filled through the fistula, segmentary activity disappeared and was replaced by irregular activity over a period of 3 - 6 hr. Thus, the presence of segmentary salvos in the rat depends upon whether the stomach is empty or full.

2509 INVESTIGATION OF SMALL BOWEL TRANSIT TIME IN MAN UTILIZING PULMONARY HYDROGEN (H_2) MEASUREMENTS. *(E.)* Bond, J. H. Jr.; Levitt, M. D.; Prentiss, R. (VA Hosp., Minneapolis, Minn.). *J. Lab. Clin. Med.* 85(4):546-555, 1975.

A new method of determining small bowel transit time, using lactulose as a test substance and pulmonary hydrogen as an indicator, was investigated. Studies were performed in 42 healthy subjects after a 12-hr fast. Isotonic lactulose solution was ingested (5, 10, or 20 g in 50, 100, or 200 ml water, resp.), and pulmonary hydrogen excretion was measured by having the subjects breathe into a closed system from which periodic aliquots were removed at 8-min intervals and analyzed by gas chromatography. Simultaneously, polyethylene glycol transit time to the terminal ileum was measured in 7 of the normal subjects plus two patients who had had partial gastric resections with Billroth II anastomoses. These subjects were intubated with a mercury-weighted 1.6-mm diameter tube with the tip in the distal ileum. Tube length varied from 275-330 cm. Lactulose (10-20 g) and polyethylene glycol (2-3 g) were ingested, hydrogen excretion was monitered, and serial samples of terminal ileal contents were aspirated every 10 min and analyzed for polyethylene glycol content. Transit time measured by the excretion hydrogen correlated closely with the simultaneously determined time for polyethylene glycol to reach the distal ileum, but lagged behind it for an average of 7.6 min. Transit time following ingestion of 10 g lactulose in 40 subjects averaged 72 min. Repeat measurements performed in 6 subjects showed good reproducibility, differing from the original measurement by ± 14%. In 9 subjects, ingestion of 5, 10, and 20g lactulose resulted in transit times of 128, 94, and 40 min, resp. It is concluded that this technique is a valid and safe means of determining intestinal transit time in man.

2510 RELATIONSHIP BETWEEN SERUM GASTRIN CONCENTRATION AND LOWER-ESOPHAGEAL SPHINCTER PRESSURE. *(E.)* Dodds, W. J.; Hogan, W. J.; Miller, W. N.; Barreras, R. F.; Arndorfer, R. C.; Stef, J. J. (Med. Coll. Wisconsin, Milwaukee). *Am. J. Dig. Dis.* 20(3): 201-207, 1975.

The relation between lower esophageal sphincter pressure and serum gastrin was studied in 16 healthy volunteers (aged 18-30 yr). Subjects fasted overnight and esophageal manometry was performed with a 5-lumen manometric assembly. Side hole recording devices were cut out at the same axial level in 4 cases so that they were radially oriented at 90 degree angles and used to record sphincter resting pressure. A 5th recording orifice was 5 cm proximal to the others. During pressure recording, each catheter was infused with water at 1.6 ml/min. The catheter assembly was passed into the stomach and the pressure recorded by both the conventional station pull-through method, requiring several min, and a rapid pull-through method with continuous withdrawal at 0.5-1.0 cm/sec., three or more of each performed in alternating sequence. Pressure from the standard method recordings was determined by subtracting mean gastric pressure from the highest mean pressure at any station, while maximal pressure from the rapid method recordings was determined by subtracting the steady state gastric pressure during breathholding from the sphincter pressure profile peak. Immediately following the pull-throughs, a venous blood sample was drawn and serum gastrin was determined. No direct correlation was found between gastrin level and lower esophageal sphincter pressure measured by either technique. A significant inverse correlation was found in 10 of the subjects who then participated in a second study 2-8 weeks later, but in the second study the inverse correlation was not significant. Four subjects were studied a 3rd time several weeks after the 2nd study, but no direct correlations were found. It is concluded that there is no simple direct relation in man between resting lower-esophageal sphincter pressure and circulating gastrin levels.

2511 DIFFERENTIATION BETWEEN THE BIOLOGICAL ACTIVITY OF ELEDOISIN AND SUBSTANCE P ANALOGS WITH REGARD TO THEIR AFFINITY TO AND ACTIVITY ON GUINEA PIG ILEUM AND COMPARISON WITH THEIR ACTIVITY ON RAT COLON. *(Ger.)* Bergmann, J.; Oehme, P.; Beinert, M.; Niedrich, H. (Cent. Inst. Mol. Biol., Berlin-Friedrichsfelde, Germany). *Experentia* 30(11):1315-1317, 1974.

2512 THE ROLE OF INHIBITORY NERVES IN COLONIC MOTILITY. *(Ger.)* Wienbeck, M. (Med. Clin., Univ. Marburg, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:850-851, 1973.

2513 MYOELECTRIC CONTROL OF THE COLON. *(E.)* Christensen, J. (Dep. Intern. Med., Univ. Iowa, Iowa City). *Gastroenterology* 68(3):601-609, 1975.

2514 EFFECTS OF ELEVATED MAGNESIUM ON ELECTRICAL DISCHARGE OF NEURONS OF AUERBACH'S PLEXUS. *(E.)* Wood, J. D. (Univ. Kansas Med. Cent., Kansas City). *Fed. Proc.* 34(3):422, 1975.

2515 COMPARATIVE INVESTIGATIONS ON THE EFFECT OF PANCREATIC GLUCAGON AND SECRETIN ON THE MOTILITY OF THE HUMAN PROXIMAL AND DISTAL GASTROINTESTINAL TRACT. *(Ger.)* Paul, F. (Med. Coll., Hannover, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79: 841-843, 1973.

2516 GASTRIC EMPTYING OF CARBOHYDRATE VS. FAT IN THE RAT. *(E.)* Trout, D. L.; Conway, E. S. (U.S. Dep. Agric., Nutr. Inst., Beltsville, Md.). *Fed. Proc.* 34(3):910, 1975.

See also, 2528.

SECRETION AND METABOLISM

2517 THE ROLE OF CALCIUM AND CYCLIC NUCLEOTIDES IN α-AMYLASE RELEASE FROM SLICES OF RAT PAROTID: STUDIES WITH THE DIVALENT CATION IONOPHORE A-23187. *(E.)* Butcher, F. R. (Div. Biol. Med. Sci., Brown Univ., Providence, R.I.). *Metabolism* 24(3): 409-418, 1975.

The role of calcium and cyclic nucleotides in the *in vitro* release of α-amylase from tissue slices of rat parotid was studied using the ionophore A-23187, which transports Ca^{++} and other divalent cations across biologic membranes in the direction of the respective cation concentration gradient. Parotid glands from 7-9-week-old female Sprague-Dawley rats were sliced and incubated in media containing A-23187 dissolved in dimethylsulfoxide. α-Amylase release and tissue cyclic nucleotide levels were measured in the presence and absence of theophylline and various blocking agents. A-23187 caused a release of α-amylase from the parotid slices. This release was not affected by the addition of 1-propranolol, phentolamine, or atropine to the incubation medium, although all of these agents blocked the effects of isoproterenol, phenylephrine, and carbamylcholine on parotid slices. The ionophore also inhibited the stimulatory effect of isoproterenol on the cyclic AMP levels in the tissue slices, but only if the slices were incubated with A-23187 for 10 min before the isoproterenol was added. A-23187 increased cyclic GMP levels in the slices after 10 min incubation; in the presence of theophylline, this elevation occurred after 5 min incubation. Both the stimulatory effect on α-amylase release and the increase in cyclic GMP by A-23187 were dependent on the presence of Ca^{++} in the incubation buffer. Although these results do not define the mechanism of Ca^{++} action in stimulus-secretion coupling, they do emphasize the importance of Ca^{++} in the regulation of cyclic nucleotide levels.

2518 DISSOCIATION OF RAT PAROTID GLAND. *(E.)* Barka, T.; Van Der Noen, H. (Mt. Sinai Sch. Med., City Univ. New York, N.Y.). *Lab. Invest.* 32(3):373-381, 1975.

2519 SHORT TERM CULTURE OF DISSOCIATED RAT SUBMANDIBULAR GLAND CELLS. *(E.)* Kanamura, S.; Barka, T. (Mt. Sinai Sch. Med., City Univ. New York, N.Y.). *Lab. Invest.* 32(3):366-372, 1975.

2520 CONTRIBUTION OF ORORHINOPHARYNGEAL AND GASTROENTERIC RECEPTORS IN REGULATION OF FOOD AND WATER INTAKE. *(Pol.)* Cytawa, J.; Luszawska, D.; Trojniar, W. (Z. Zakladu Physiol. Inst. Biol. Med., Gdansk, Poland). *Przegl. Lek.* 31(2):272-276, 1974.

2521 LOCALIZATION OF 1,25-DIHYDROXY-VITAMIN D_3 IN CHICK PARATHYROID GLANDS. *(E.)* Henry, H. L. (Dep. Biochem., Univ. California, Riverside). *Fed. Proc.* 34(3):894, 1975.

2522 EFFECT OF FEEDING DIFFERENT LEVELS OF CORN OIL ON THE COMPOSITION OF SUBMANDIBULAR SALIVARY GLAND FATTY ACIDS IN RATS. *(E.)* Alam, S. Q. (Sch. Dent., Lousiana State Univ., New Orleans). *Arch. Oral Biol.* 20(2):97-102, 1975.

2523 POSTNATAL DEVELOPMENT OF ADENYLATE CYCLASE IN RAT SALIVARY GLANDS: PATTERNS OF HORMONAL SENSITIVITY. *(E.)* Grand, R. J.; Chong, D. A.; Ryan, S. J. (Harvard Med. Sch., Boston, Mass.). *Am. J. Physiol.* 228(2):608-612, 1975.

2524 METABOLIC INTERACTIONS OF GLUCOSE, ACETOACETATE AND ADRENALINE IN RAT SUBMAXILLARY GLAND IN VITRO. *(E.)* Thompson, M. P.; Williamson, D. H. (Radcliff Infirm., Oxford, England). *Biochem. J.* 146(3):635-644, 1975.

SECRETION AND METABOLISM

Stomach

2525 EFFECT OF SECRETIN ON THE SECRETION OF ACID AND PEPSIN BY THE TOTALLY ISOLATED CANINE STOMACH. *(E.)* Kowalewski, K.; Kolodej, A. (Surg. Med. Res. Inst., Univ. Alberta, Edmonton, Canada). *Pharmacology* 12(1):57-63, 1974.

Totally isolated whole canine stomachs, perfused *ex vivo* with homologous blood, were used for study of the action of secretin on gastric secretion of acid and pepsin. During 8 hr of perfusion, stomachs were stimulated by constant infusion of 32 µg/hr of pentagastrin into gastric arteries of isolated organs. When base line secretion was established (after 3.5 hr), secretin, (60 U/hr) was also infused for 90 min into the gastric artery. Secretin injection was then interrupted, but pentagastrin infusion continued until the termination of the experiment. Secretin produced decreases of 60%, 74% and 36% in gastric secretory volume, acid output and acid concentration, resp., while stimulating pepsin output and concentration by 236% and 800%, resp. The maximal effect was seen after 30-60 min and persisted for 1-3 hr after secretin was discontinued. The dissociation of the effects of secretin on gastric acid and pepsin secretion in this system resembles the action of secretin on gastric secretion reported by others in various *in vivo* experiments.

2526 HISTAMINE RELEASE BY GASTRIC STIMULANTS. *(E.)* Rangachari, P. K. (Univ. California Sch. Med., San Francisco). *Nature* 253(5486):53-54, 1975.

The rates of histamine and acid release in response to pentagastrin, acetylcholine and dibutyryl cyclic AMP (cAMP) were studied in the isolated gastric mucosa of the bullfrog, *Rana catesbeiana*. Acid secretion from freshly mounted mucosa ranged from 6-10 µEq/hr but declined to resting levels of $\leq$ 2 µEq/hr over an 8-12 hr period, in spite of nutrient solution replenishment. Histamine release as determined by fluorometric analysis, decreased over the same period from about 500 ng/hr to a resting level of about 140 ng/hr. Addition of pentagastrin (5×10^{-6}M) or acetylcholine (10^{-3}M) to resting mucosa produced a 2-fold increase in the rates of both histamine and acid release, the peak of histamine release (15 min) preceeding that of acid secretion (25-30 min). Dibutyryl cAMP (5mM) produced a 5-fold increase in acid secretion but had no effect on histamine release. Acid secretion of resting mucosa was also stimulated by addition of nutrient solution incubated for 90 min with actively secreting mucosa. It is thus concluded that histamine released by frog gastric mucosa is responsible for stimulating acid secretion *in vitro* and that histamine is the common mediator for acetylcholine and pentagastrin in this system.

2527 EFFECT OF HISTAMINE ON IMMUNOREACTIVE GASTRIN IN GASTRIC JUICE AND IN SERUM. *(E.)* Stadil, F.; Malmstrom, J.; Miyata, M; Rehfeld, J. F. (Righosp., Copenhagen, Denmark). *Surgery* 77(3):345-350, 1975.

Gastric juices from 82 patients with various dyspeptic disorders were analyzed by radioimmunoassay for gastrin following histamine injection (0.04 mg/kg s.c.). Preliminary *in vitro* studies showed that gastrin added to untreated gastric juice decreased rapidly from 135 pg/ml to less than 10 pg/ml in less than 1 min. This could be prevented by boiling or neutralizing the gastric juice. None or only a trace amount of gastrin was found in untreated, boiled, or boiled and neutralized gastric juice in every patient, including 3 patients with achlorhydria. Histamine injection (0.04 mg/kg s.c.) did not influence this and was without effect upon serum gastrin concentrations of 9 duodenal ulcer patients. Because gastrin apparently is degraded rapidly by gastric juice, this study does not necessarily disprove that gastrin is secreted into the stomach. However, the virtual absence of gastrin in all specimens examined, including some collected directly upon boiling water bath during continuous gastric aspiration, lends no support to this speculation. Because gastrin does not survive even a short exposure to gastric juice without degradation, it is suggested that earlier reports on the presence of gastrin within the stomach are questionable.

2528 THE EFFECT OF OPTIMUM THERAPEUTIC DOSE OF POLDINE ON ACID SECRETION, GASTRIC ACIDITY, GASTRIC EMPTYING, AND SERUM GASTRIN CONCENTRATION AFTER A PROTEIN MEAL. *(E.)* Bieberdorf, F. A.; Walsh, J. H.; Fordtran, J. S. (Univ. Texas Southwest. Med. Sch., Dallas). *Gastroenterology* 68(1):50-57, 1975.

The effects of the optimum therapeutic dose of poldine on gastric function was studied in 5 normal volunteers. Five oz. of steak and a slice of toast and butter were homogenized, the pH set at 5.0, and infused into the stomach through a Levin tube. Acid secretion rate was measured for 3 hr after the meal by *in vivo* titration with $NaHCO_3$. To measure gastric pH and acidity, pH was measured by pH meter on a separate day. On a 3rd day of experiment, 5 g polyethylene glycol in 25 cc water were infused into the stomach 90 min after the meal. Stomach contents were then mixed and aspirated, and the stomach rinsed with saline and again aspirated, and the gastric volume and buffer content calculated. All experiments were done both with and without poldine. Poldine reduced acid secretion by 25-40% from 1 hr after the start of the experiment. Gastric acidity after poldine was reduced from 15% at 90 min to 50% after 180 min. Gastric volume and buffer content at 90 min were calculated to be 370 ml and 21 mEq, resp. It is concluded that the inhibition of gastric acidity by poldine is due to reduced secretion rather than to delayed emptying of food buffer.

2529 DEPLETION OF ANTRAL GASTRIN AFTER FOOD IN RATS. *(E.)* Reeder, D. D.; Watayou, T.;

Booth, R. A. D.; Thompson, J. C. (Univ. Texas Med. Branch, Galveston). *Am. J. Surg.* 129(1):67-70, 1975.

The effect of feeding on tissue gastrin values was studied in rat fundus, antrum and proximal small intestine. Sprague-Dawley rats (80) were fasted for 48 hr, fed, and in groups of 10 decapitated at 5, 10, 15, 20, 25, 30, and 40 min after feeding. Ten non-fed rats served as controls. Blood was immediately taken from the neck for radioimmunoassay, and the stomach, duodenum, proximal 5 cm of the jejunum and a specimen of the rectus abdominus muscle were removed. Serum gastrin concentrations in all fed rats were significantly higher than control values (269 pg/ml after 25 min and 160 pg/ml, resp.). Serum gastrin concentrations in the antrum were significantly less than control values (2690 ng/g at 5 min and 3850 ng/g at 15 min *versus* 6900 ng/g in fasting controls). Total gastrin content dropped from 1289 ng to 647 ng at 5 min, and to 428 ng at 30 min. In the gastric fundus the concentration increased from 9.7 to 21.8 ng/g in 40 min. Gastrin content increased from 12.5 to 28.1 ng. In the duodenum, gastrin-like immunoreactivity concentration rose from 77.2 to 260 ng/g after 25 min. Content rose significantly from a control value of 99.4 ng. It is concluded that in rats, feeding causes an abrupt increase in serum gastrin persisting for at least 40 min, that the fundus is a target organ, and the duodenum probably synthesizes gastrin. The antrum results suggest that early gastrin release may trigger a mechanism for synthesis that reacts cyclically with the release.

2530 ROLE OF BILE ACIDS IN THE PATHOGENESIS OF ASPIRIN-INDUCED GASTRIC MUCOSAL HEMORRHAGE IN RATS.

(E.) Semple, P. F.; Russell, R. I. (R. Infirm., Glasgow, Scotland). *Gastroenterology* 68 (1):67-70, 1975.

The effect of combined aspirin and bile acids on gastric mucosal hemorrhage was studied in the rat. Sprague-Dawley rats were fasted 24 hr and fed acetylsalicylic acid in a 1% suspension of carboxymethylcellulose to which was added in different cases 5 mM of various bile acids in glucose saline. Controls were given equal parts of the acetysalicylic acid suspension and the glucose saline. All administered solutions had a pH of 4.5. The rats were killed 4 hr after administration and the stomachs removed and examined for hemorrhage. A dose of 64 mg/kg of acetylsalicylic acid was found to cause lesions in 32% of the rats, and this dose was then used in conjunction with taurocholic, taurodeoxycholic, glycholic, cholic, deoxycholic, or chenodeoxycholic acids. Significant findings were lesions in 82.4% of the rats treated with taurocholic acid, 64.3% with taurodeoxycholic acid, and 64.3% with glycholic acid. Bile acids used without acetylsalicylic acid had no effect. It is concluded that certain bile acids reduce the threshold for aspirin-induced gastric mucosal damage in the rat.

2531 THE EFFECT OF VAGAL STIMULATION ON GASTRIN RELEASE AND ACID SECRETION.

(E.) Maher, J. W.; Wickbom, G.; Woodward, E. R.; McGuigan, J. E.; Dragstedt, L. R. (Coll. Med., Univ. Florida, Gainesville). *Surgery* 77(2):255-260, 1975.

Serum gastrin response to vagal stimulation was studied in 8 mongrel dogs with gastrointestinal continuity. Each dog was given a chronic esophageal fistula and a vagally-denervated fundic pouch. Six were later given an isolated vagally-innervated antral pouch and a gastroduodenostomy to reestablish continuity. Before and after the creation of the antral pouch the dogs were sham fed 500 g horsemeat after a 20 hr fast. The meal was constantly removed through the esophageal fistula and recycled for 30 min. Gastric juice was collected from the fundic pouches every 15 min for 1 hr before and 3 hr after each sham feeding, and the acid output determined. Blood for serum gastrin determination by radioimmunoassay was drawn just before sham feeding and hourly afterwards until the acid output returned to basal level. Preoperative sham feeding caused a gastric acid increase from 32-322 μEq/15 min and of serum gastrin from 32-43 pg/ml (the latter not statistically significant). After the antral pouches had been created, the basal serum gastrin level was unchanged but sham feeding caused a rise to 177 pg/ml which decreased to 89 pg/ml after 1 hr and 51 pg/ml by 3 hr. There was no significant change in the acid output. It is concluded that vagal gastrin release in sham fed dogs with gastrointestinal continuity is small or insignificant, and direct vagal stimulation of the parietal cells is the major mechanism in sham feeding-induced acid secretion.

2532 GASTRIN CELL HYPERPLASIA IN RATS WITH CHRONIC ANTRAL STIMULATION.

(E.) Lehy, T.; Voillemot, N.; Dubrasquet, M.; Dufougeray, F. (INSERM, Beaujon Hosp., Clichy, France). *Gastroenterology* 68(1):71-82, 1975.

Topographic distribution of antral gastrin cells was studied in rats with antrocolic transpositions to verify whether colonic conditions could modify gastrin and other endocrine cell populations after acid feedback suppression. Wistar rats (9 males) were surgically prepared with transposition of total gastric antrum onto the colon, and provided with a gastric fistula in the rumen; 9 controls were given only the fistula. All were fasted for 18 hr. A blood sample was taken for radioimmunoassay and a 2 hr basal gastric secretory study was performed. The rats were killed 15 days after surgery, and the entire stomach and the antrum with its adjacent colon were fixed in Bouin's fluid. The specimens were cut into strips and adjacent sections studied by immunofluorescence and argyrophilic techniques, and by electron microscopy. The acid output of the operated rats (489 μEq/2 hr) showed a significant increase over that of the controls (130 μEq/2 hr), and gastrinemia was also significantly elevated (171 pg/ml for operated; 20 pg/ml for controls). In the operated rats, gastrin cells were found to be significantly more numerous than in the controls except in the strip closest to the pylorus. Values increased from 4.3 to 6.7 (esophagus to pylorus) in controls and remained between 7.1 and 7.2 in operated rats, dropping to 6.7 in the last strip nearest the ligation. The argyrophil cell count increased slightly toward the esophageal junction and decreased significantly in the middle 3rd of all strips, but mean counts were higher than those of controls. There was a 78% increase in gastrin cells/glandular tube, but the gastrin:argyrophil ratio was similar in both operated and control rats. Electron micrography also showed an increase in the number of all endocrine cells in the tubes. It is concluded that antrocolic transposition results in increases in density of both argyrophil and gastrin cells after 15 days.

2533 ABERRATIONS IN HOLLANDER TEST RESPONSE AFTER INCOMPLETE VAGOTOMY. COMPENSATING EFFECT OF ANTRAL RESECTION IN THE DOG. *(E.)* Vogel, S. B.; Orahood, R. C.; Eisenberg, M. M. (Dep. Surg., Univ. Minnesota, Minneapolis). *Am. J. Surg.* 129(1): 55-61, 1975.

The role of antral gastrin was evaluated in the response to Hollander vagal stimulation after partial vagotomy with either pyloroplasty or antrectomy. Fourteen mongrel dogs were given gastric fistulas and fasted 18 hr prior to experimental procedures. Response to vagal stimulus by i.v. insulin (0.2 U/kg) or 2-deoxy-D-glucose (200 mg/kg) or parietal cell stimulation by histamine infusion (0.16 mg/kg/hr) were tested. Gastric juice samples were collected every 30 min and the acidity determined. During vagal stimulation, venous blood samples were collected every 15 min for 1 hr and every 30 min subsequently. After control measurements were made, the dogs were given either an anterior vagectomy and pyloroplasty, or an anterior vagectomy and a Billroth I pylorus-preserving antrectomy, and the experiments were repeated. In the group given the pyloroplasty, there was a 19% reduction in acid response to both insulin and 2-deoxy-D-glucose from control values (12.05 and 13.18, resp.). The serum gastrin concentration was uniformly elevated over control values, but not to a significant degree. In the antrectomized group the peak acid outputs were 0.51 and 3.68 mEq after insulin and 2-deoxy-D-glucose, resp., representing reduction from control values of 96 and 67%, resp. Surgery had no apparent effect on histamine-induced acid secretion. It is concluded that the Hollander test may be inaccurate and misleading in vagotomy assessment in antrectomized patients.

2534 INFLUENCE OF PANCREATIC SECRETION ON GASTRIC SECRETION IN DOGS. *(E.)* Palasciano, G.; Tiscornia, O.; Dzieniszewski, J.; Sarles, H.; Vincent, J. P.; Lazdunski, M. (Dig. Pathol. Res. Unit, INSERM, Univ. Nice, France). *Digestion* 11(1/2):64-71, 1974.

The influence of pancreatic secretion on gastrin-stimulated gastric secretion was studied in dogs. Seven dogs were prepared with chronic gastric and duodenal fistulas; gastrin (6 μg/kg/hr) was continuously infused at a constant rate *via* a polyethylene catheter inserted into a leg vein. Pancreatic juice was collected and stored; gastric juice was collected after each 15 min period. When the plateau level of gastric secretion was reached (45-60 min), solutions of test material were infused into the second part of the duodenum and each successive 15 min period value was compared to the plateau level values of gastric secretion. Gastric secretion was significantly decreased after the administration of lyophilized pig pancreas (62%), pancreatic juice (57%), and bovine trypsinogen (33%). Intraduodenal administration of isotonic saline solution, lyophilized pig meat, trypsin, and chymotrypsinogen failed to decrease gastric secretion. The results indicate that exocrine pancreatic secretion decreases gastric secretion in dogs, and that the alkaline and protein components of the pancreatic secretion play a role in the duodenal regulation of pH; the alkaline component neutralizes the H^+ in the duodenum, and the protein component acts by means of the activation peptide of trypsinogen.

2535 INCREASED HISTIDINE AND DOPA DECARBOXYLASE ACTIVITY IN THE RAT STOMACH DURING RESTRAINT ULCER FORMATION. *(E.)* Schauer, A.; Kunze, E.; Feifel, G.; Permanetter, W.; Fraps, P. (Inst. Pathol., Univ. Munich, Germany). *Digestion* 11(1/2):12-24, 1974.

The activities of histidine decarboxylase and dopa decarboxylase (which produce the vasoactive histamine and dopamine) were determined radiometrically to investigate their possible relation with the development of gastric mucosal erosions in rats. Restraint stress was induced in 250 Wistar rats by enclosing their bodies in plaster casts. At 2 hr intervals for 3-30 hr, the stomachs were removed and the number, position, and diameter of mucosal erosions were determined; the glandular portions were minced, homogenized, and analyzed for both amino acid decarboxylases by a micromethod measuring liberated $^{14}CO_2$ radiometrically. In another series of restrained rats, histological examinations were done on sections of the glandular part of the stomach. On gross examination, erosions (almost exclusively in glandular part of stomach) were seen in 40% of the animals after 3 hr stress; the figure subsequently rose to 100% with increased duration of restraint. After 3 hr, the histidine decarboxylase showed a continuous increase in activity and attained a maximum of more than twice the control activity between 9 and 11 hr. The dopa decarboxylase activity was moderately raised until 11-13 hr after the beginning of immobilization and showed twice the activity after 13-15 hr. The activity of both amino acid decarboxylases decreased to below the normal level after 21 hr. The localization of histamine in the glandular portion of the stomach provided further argument for its participation in the formation of stress-induced erosions; the highest activity of histidine decarboxylase was also found in that area. Interpretation of the increase of dopa decarboxylase is speculative, and the need for further investigation is stressed.

2536 EFFECT OF NICOTINE HYDROGEN TARTRATE ON GASTRIC SECRETION OF NORMAL AND VAGOTOMIZED

RATS STIMULATED WITH HISTAMINE PENTAGASTRIN AND BETHANECHOL CHLORIDE. *(E.)* Kowalewski, K. (Surg.-Med. Res. Inst., Univ. Alberta, Edmonton, Canada). *Digestion* 10(6):393-401, 1974.

Wistar rats with permanent gastric fistulas, some of which had been vagotomized, were given acute and chronic infusions of nicotine to determine its effect on 24-hr output of HCl and pepsin. Secretion was stimulated by constant i.v. infusion of histamine, pentagastrin, or bethanechol chloride. Nicotine hydrogen tartrate was used in acute and chronic experiments. An i.v. infusion (240 μg/kg) for 24 hr with simultaneous collection of gastric juice demonstrated the inhibitory action of this drug on basal secretion and secretion stimulated with histamine (100 mg/kg), pentagastrin (768 μg/kg), and bethanechol chloride (2.5 mg/kg). Inhibition affected the output of HCl and pepsin, also the concentration of HCl. In nonstimulated and in bethanechol-stimulated rats, nicotine hydrogen tartrate also decreased the concentration of pepsin. Chronic treatment (given s.c.) induced the inhibition of gastric secretion under various stimulation conditions. The vagotomy-induced decrease in response to the stimulants was further reduced when nicotine hydrogen tartrate was added to the stimulants. The authors suggest the possibilities that nicotine hydrogen tartrate may directly affect chief cells of gastric glands in rats or alter the responsiveness of the cells to humoral and cholinergic stimulants.

2537 INFLUENCE OF THE PROXIMAL SMALL INTESTINE ON THE GASTRIC HYPERSECRETION IN PYLORUS-LIGATED RATS. *(E.)* Okabe, S.; Takeuchi, K.; Nakamura, K.; Takagi, K. (Fac. Pharm. Sci., Univ. Tokyo, Japan). *Am. J. Dig. Dis.* 20(2):138-147, 1975.

The mechanism of gastric-secretory inhibition caused by the simultaneous ligation of upper and lower duodenum, jejunum, or bile duct was studied in pylorus-ligated Donryu rats. Additional experiments were done, including treatment with atropine sulfate (10 mg/kg s.c.) 30 min before pylorus-ligation and acidification of the duodenum with 2 ml 0.1 N HCl. The animals were killed (3-7 hr after experiments) and gastric contents collected and centrifuged. Determinations were made for pH, total acid output, and pepsin activity; the intestinal contents were examined quantitatively for volume and pH. The simultaneous ligation of individual points of the proximal small intestine, especially the end of the duodenum, in pylorus-ligated rats caused significant inhibition of gastric secretion (volume, acidity, and acid output). The participation of biliary secretion was negligible. The study suggests that several parts of the proximal small intestine appear to have pressure receptors which lead to the inhibition of gastric secretion and that the inhibition is independent of cholinergic nervous blocking and independent of hormonal influence (assumed to be produced by intestinal acidification); the need for further study is stressed.

2538 INVESTIGATION OF THE VASODILATOR AND ANTISECRETORY ROLE OF PROSTAGLANDINS IN THE RAT GASTRIC MUCOSA BY USE OF NON-STEROIDAL ANTI-INFLAMMATORY DRUGS. *(E.)* Main, I. H. M.; Whittle, B. J. R. (Sch. Pharm., Univ. London, England). *Br. J. Pharmacol.* 53(2):217-224, 1975.

The effects of non-steroidal anti-inflammatory drugs on gastric acid secretion and mucosal blood flow were studied in the rat to test the hypothesis that prostaglandins have a physiological role as negative feed-back inhibitors of acid secretion and as vasodilators in the gastric mucosa. The relation between inhibition of prostaglandin synthesis and the formation of mucosal erosions was also investigated. Acid output into the perfused gastric lumen was measured and mucosal blood flow determined simultaneously in Wistar rats. Following drug treatment, the rats were killed at various time intervals and the stomachs removed. Erosions, which formed only in the glandular mucosa, were counted and rated for severity. During resting conditions, indomethacin (30 mg/kg i.v.) had no significant effect on acid output, but reduced mucosal blood flow. When given in ulcerogenic doses (20 and 40 mg/kg), it caused a dose-dependent rise in pentagastrin-stimulated acid secretion, but decreased mucosal blood flow/U acid secretion. Pretreatment with indomethacin, phenylbutazone, or meclofenamate potentiated the secretory response to dibutyryl cyclic adenosine 3',5'-monophosphate. Indomethacin significantly reduced the mucosal prostaglandin-like activity at a time when mucosal erosion formation had reached steady levels. These results provide evidence that prostaglandins have a local role in the regulation of blood flow and acid secretion in the rat gastric mucosa, and suggest that non-steroidal anti-inflammatory drugs cause mucosal erosions by disrupting these processes.

2539 THE EFFECTS OF BURIMAMIDE AND METIAMIDE ON BASAL GASTRIC FUNCTION IN THE CAT. *(E.)* Harris, D. W.; Smy, J. R.; Reed, J. D.; Venables, C. W. (Dep. Pharm., Sunderland Polytech., England). *Br. J. Pharmacol.* 53(2):293-297, 1975.

The effects of burimamide and metiamide on basal gastric acid secretion and blood flow in the anesthetized cat and on acid secretion in the conscious cat were investigated. Burimamide or metiamide (2 mg/kg) was administered as a single i.v. injection, and gastric acid output was determined at 15 min intervals. In eight anesthetized cats, burimamide caused a 5-fold increase of acid secretion (30.9-150.9 μEq H^+/15 min) and increased mucosal blood flow 46% (18.7-27.4 ml/15 min). In nine conscious cats, the same dose of burimamide also increased acid secretion (24.1-174.1 μEq H^+/15 min). Metiamide, in six anesthetized cats, decreased acid secretion (51-0.8 μEq H^+/15 min) and mucosal blood flow (22.9-13.3 ml/15 min). When metiamide was given in a dose which inhibits pentagastrin-stimulated acid secretion (4 mg/kg i.m.) to six conscious cats, no significant changes were observed. Metiamide did not influence the amount of acid which diffused out of the stomach when instilled at pH 1.5-6.0. It is suggested that in increasing basal gastric secretion, burimamide stimulates acid secretion in the previously unstimulated stomach through release of some intermediary substance.

2540 SODIUM LOCALIZATION IN NORMAL, PENTAGASTRIN-STIMULATED AND SECRETIN-INHIBITED RAT GASTRIC MUCOSA. *(E.)* Kalahanis, N. G.; Das Gupta, T. K.; Nyhus, L. M. (Univ. Illinois Coll. Med., Chicago). *Fed. Proc.* 34(3):453, 1975.

2541 EFFECT OF AUTONOMIC BLOCKING AGENTS ON HISTAMINE AND TETRAGASTRIN INDUCED HCl SECRETION IN DOGS. *(E.)* Evans, D. C.; Lin, T. M. (Lilly Res. Lab., Indianapolis, Indiana). *Fed. Proc.* 34(3):442, 1975.

2542 EFFECTS OF AGONISTIC AND ANTAGONISTIC DRUGS OF THE ALPHA AND BETA RECEPTORS ON FROG GASTRIC MUCOSA. *(E.)* Farmer, J. M.; Carrasquer, G.; Holloman, T. L.; Schwartz, M. (Dep. Med., Univ. Louisville, Ky.). *Fed. Proc.* 34(3):442, 1975.

2543 ANALYSIS OF PENTOSE PHOSPHATE SHUNT IN RAT AND FROG GASTRIC MUCOSAE. *(E.)* Sernka, T. J. (Louisiana State Univ. Med. Cent., Shreveport). *Comp. Biochem. Physiol.* [B] 50(2):351-353, 1975.

2544 EFFECTS OF HYPOPHYSECTOMY AND GROWTH HORMONE ON SERUM AND ANTRAL GASTRIN. *(E.)* Enochs, M. R.; Johnson, L. R. (Univ. Texas Med. Sch., Houston). *Fed. Proc.* 34(3):441, 1975.

2545 HEPATIC AND MESENTERIC METABOLISM OF C-TERMINAL PENTAPEPTIDE OF GASTRIN IN THE RAT. PART II. PATHWAYS OF PENTAGASTRIN INACTIVATION IN THE RAT. *(E.)* Varro, V.; Nafradi, J. (Univ. Med. Sch., Szeged, Hungary). *Acta Hepatogastroenterol. (Stuttg.)* 21(6):441-445, 1974.

2546 ACID SECRETION FROM THE ISOLATED PERFUSED CANINE STOMACH. *(E.)* Pilot, M. A. (London Hosp. Med. Coll., England). *J. Physiol. (Lond.)* 245 (2):104P-105P, 1975.

2547 GASTRIC SECRETION OF THE RABBIT AND THE TWO-COMPONENT HYPOTHESIS. *(Fr.)* Beauville, M.; Raynaud, P.; Vernay, M. (Inst. Physiol., Paul Sabatier Univ., Toulouse, France). *Biol. Gastroenterol. (Paris)* 7(3):215-219, 1974.

2548 ALKALINE GASTRIC SECRETION AND INTERSTITIAL PRESSURE. *(E.)* Altamirano, M.; Requena, M.; Perez, T. (J.M. Vargas Sch. Med., Cent. Univ. Venezuela, Caracas). *Fed. Proc.* 34(3):453, 1975.

2549 EFFECT OF ELECTRICAL STIMULATION OF THE HYPOTHALAMIC FEEDING AREA ON GASTRIC SECRETION IN CATS. *(E.)* Wyrwicka, W. (VA Wadsworth Hosp. Cent., Los Angeles, Calif.). *Fed. Proc.* 34(3): 441, 1975.

2550 THE GASTRIC RESPONSE TO SUBDIAPHRAGMATIC ELECTRICAL STIMULATION OF THE VAGUS NERVES IN THE ANESTHETIZED CAT. *(E.)* Bauer, R. F.; Adair, L. S.; Brooks, F. P. (no affil.). *Fed. Proc.* 34(3): 441, 1975.

2551 EVIDENCE OF NON-VAGAL NEURAL STIMULATION OF CANINE GASTRIC ACID SECRETION. *(E.)* Tansy, M. F.; Probst, S.; Martin, J. S. (Temple Univ. Health Sci. Cent., Philadelphia). *Fed. Proc.* 34(3):441, 1975

2552 STUDIES ON THE INHIBITION OF STIMULATED GASTRIC SECRETION BY INTRADUODENAL ADMINISTRATION OF FATTY ACIDS. *(Ger.)* Schmidt-Wilcke, H. A.; Steinhagen, E.; Steinhagen, P.; Lapp, M. (Med. Clin., Univ. Marburg, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:873-876, 1973.

2553 THE EFFECT OF INTRAGASTRIC CALCIUM ON GASTRIC JUICE SECRETION IN HUMANS. *(Ger.)* Holtermuller, K. H.; Go, V. L. W. (Mayo Clin., Rochester, Minn.). *Verh. Dtsch. Ges. Inn. Med.* 79: 832-834, 1973.

2554 INHIBITION OF GASTRIC SECRETION IN DOGS BY A SYNTHETIC PROSTAGLANDIN (PGE_2). *(E.)* Mihas, A.; Gibson, R.; Hirschowitz, B. I. (Univ. Alabama Med. Cent., Birmingham). *Fed. Proc.* 34(3): 442, 1975.

2555 GASTRIC ACID SECRETION AND ULCEROGENESIS IN CYSTEAMINE-TREATED RATS. *(E.)* Wilder, D. E.; Hohnke, L. A. (Pfizer Cent. Res., Groton, Conn.). *Fed. Proc.* 34(3):442, 1975.

2556 ULTRASTRUCTURAL CHARACTERIZATION OF PROPIONITRILE-INDUCED DUODENAL ULCER IN THE RAT. *(E.)* Giampaclo, C.; Feldman, D.; Reynolds, E. S.; Dzau, V. J.; Szabo, S. (Peter Bent Brigham VA Hosp., Boston, Mass.). *Fed. Proc.* 34(3):227, 1975.

2557 EFFECT OF ANTACIDS ON ACID BINDING AND GASTRIN LIBERATION IN MAN. *(Ger.)* von Berger, L.; Dollinger, H. C.; Raptis, S. (Cent. Intern. Med. Pediatr., Univ. Ulm, Germany). *Z. Gastroenterol.* 13(1):5-11, 1975.

See also, 2454, 2505, 2515, 3020, 3024, 3057, 3059, 3062, 3063, 3064, 3065.

SECRETION AND METABOLISM

Pancreas

2558 THE EFFECT OF CHRONIC HYPERGASTRINEMIA ON THE PANCREAS OF THE RAT. *(Fr.)* Chariot, J.; Lehy, T.; Nasca, S.; Dubrasquet, M. (Bichat Hosp., Paris, France). *Biol. Gastroenterol. (Paris)* 7:221-236, 1974.

The weight of the pancreas, its total DNA content, pancreatic enzyme activities and total protein, and pancreatic enzyme secretion were measured on fasting male Wistar CF rats with chronic hypergastrinemia induced by antrocolonic transposition. Controls consisted of intact rats, rats with gastric fistulas, and antrectomized rats. Studies were performed 14, 30, and 45 days and 6 months after antrocolonic transposition. Chronic hypergastrinemia had no effect on the weight of the pancreas. In comparison to the controls, total pancreatic DNA was significantly increased in rats with chronic hypergastrinemia 30 and 45 days and 6 months after surgery, while enzyme activities in pancreatic homogenates were decreased in some cases. At 14 days after surgery, pancreatic secretion of amylase, lipase, trypsin, and chymotrypsin did not differ significantly in rats with hypergastrinemia and those with gastric fistula and antrectomies. Areas of pancreatitis, which increased in frequency and severity with the time after surgery, were observed in rats with hypergastrinemia. A slight weight gain 6 months after antrocolonic transposition suggests that nutritional disorders accompany antrocolonic transposition and make long-term results more difficult to interpret. These results differ from those obtained previously by long-term treatment with pentagastrin. These discrepancies might be due to differences in the nature of the gastrin stimulants, gastrin doses, and ages of the rats. It is concluded that pancreatic secretion in the rat is not significantly affected by gastrin stimulation.

2559 THE ELECTROGENIC SODIUM PUMP IN THE HYPERPOLARIZING AND SECRETORY EFFECTS OF PANCREOZYMIN IN THE PANCREATIC ACINAR CELL. *(E.)* Kanno, T. (Fac. Vet. Med., Hokkaido Univ., Sapporo, Japan). *J. Physiol. (Lond.)* 245(3):599-616, 1975.

The hyperpolarizing effect of pancreatic secretagogues on pancreatic acinar cells was studied, along with the mechanism involved in the effect of pancreozymin on the acinar membrane potential. The transmembrane potential, effective membrane resistance, and amylase release were recorded simultaneously from the acinar cells of rat pancreas (taken from young male Wistar rats) perfused with Krebs-Henseleit solution. Continuous stimulation with 5 U pancreozymin/ml perfusing solution produced the highest and most prolonged amylase output, confirming the hyperpolarizing effect of the secretagogue. The hyperpolarizing effect disappeared under conditions of low ambient temperature, the absence of K$^+$, low Na concentrations, and in the presence of ouabain (10^{-5} M). In these environments, particularly with high concentrations of pancreozymin (200 U/ml), transient depolarization was frequently observed immediately after stimulation. All of these conditions which inhibited the secretory effect of pancreozymin are known to suppress the electrogenic Na pump. When a Krebs-Henseleit solution containing pancreomyzin was used to bathe the sectioned pancreas for 1 hr and then used to perfuse an isolated, non-sectioned pancreas, the bathing solution depolarized the acinar cells and decreased the effective membrane resistance. An increase in amylase release was observed at the initial perfusion with the bathing medium, but was not seen at the second perfusion. It is suggested that pancreozymin acts on the basal side of the membrane of the pancreatic acinar cell to produce dual effects. An increase in Na$^+$ and Ca^{2+} permeabilities leads to a rise in $[Ca^{2+}]_i$ which initiates the release of enzyme, and enhancement of the electrogenic Na pump maintains the Ca-influx and the consequent enzyme release.

2560 ATROPINE AND EXOCRINE PANCREATIC SECRETION IN ALCOHOL-FED DOGS. *(E.)* Tiscornia, O. M.; Palasciano, G.; Sarles, H. (Res. Unit Dig. Pathol., INSERM, Marseille, France). *Am. J. Gastroenterol.* 63(1):33-36, 1975.

The mechanism by which the stimulation of pancreatic secretion is triggered by acute i.v. ethanol in alcohol-fed dogs was studied. Five dogs were provided with chronic pancreatic and gastric fistulas (Thomas cannula). Ethanol (2 gm/kg diluted to 50% in isotonic saline) was administered daily through the gastric cannula, and the effects of acute i.v. ethanol injection (1.3 gm/kg) on the exocrine pancreatic secretion was tested before and 1.5, 3, 9, 12, and 17 months after the start of chronic alcohol intoxication. In all dogs, including one which had been subjected to truncal vagotomy, acute ethanol treatment elicited a rise in all cholecystokinin- and secretin-stimulated pancreatic secretion plateau values, particularly protein output. Cholinergic blockade by a continuous i.v. infusion of atropine inhibited primarily the protein component in the cholecystokinin- and secretin-stimulated juice. Atropine (1 mg/hr) superimposed on continuous secretin (1 CU/kg/hr) and CCK (3 u/kg/hr) injection prevented the excitatory effects of acute ethanol infusion on pancreatic secretion. Similar results had previously been found with the ganglionic blocking agent pentolinium. The data indicate that when given to alcohol-treated dogs, acute i.v. ethanol exerts its stimulatory effect on 'pancreon' *via* a cholinergic mechanism. This would be triggerd by stimulation of the parasympathetic hypothalamic centers and/or the autonomic intrapancreatic ganglia.

2561 EXOCRINE PANCREATIC FUNCTION IN URAEMIC RATS. *(E.)* Fleischer, K.; Kasper, H. (Med. Clin., Univ. Wurzburg, Germany). *Acta Hepatogastroenterol. (Stuttg.)* 21(6):398-403, 1974.

The exocrine pancreatic function in uremic rats was studied *in vivo* at 35 and at 100 days after 80-85%

nephrectomy. Exocrine pancreatic secretion was stimulated by continuous infusion of 25 U/kg/hr of secretin and 25 U/kg/hr of pancreozymin; pancreatic juice was collected at hourly intervals after cannulation of the pancreatic duct. The volume secreted in the uremic animals at 35 days increased by 83% during the first hr and 109% the second hr; the protein concentration and enzyme activities decreased, 39% for protein and 33% for lipase activity during the second hr. In animals which had been uremic for 100 days, pancreatic secretion was unchanged compared with controls. The hypersecretion of the exocrine pancreas in the initial phase of uremia appears to reflect the initial lesions of the exocrine pancreas.

2562 SECRETION OF CALCIUM IN PANCREATIC JUICE. *(E.)* Ceccarelli, B.; Clemente, F.; Meldolesi, J. (Dep. Pharmacol., Univ. Milan, Italy). *J. Physiol. (Lond.)* 245(3):617-638, 1975.

The origin of the calcium secreted by the pancreas was studied *in vivo* by analyzing the pancreatic juice secreted by the guinea pig in response to stimulation with secretin or cerulein, and by analyzing on a subcellular level the relation of the pancreatic tissue to its calcium secretory activity. Juice was collected from the cannulated pancreatic ducts of pentobarbitone-anesthetized male albino guinea pigs, into which tracers and secretagogue drugs were injected i.v. In agreement with previous findings, the concentration of calcium was low in the secretin-stimulated and high in the cerulein-stimulated juice. In the latter, calcium was proportional to protein. Following ^{45}Ca injection, the radioactivity in the blood plasma decreased rapidly and quasi-exponentially. The concentration of tracer in the secretin-stimulated juice remained relatively stable, at a level 1/3-1/4 of that in the plasma, whereas the concentration was 4- to 8-fold higher in the cerulein-stimulated juice. Switching from one type of secretion stimulation to the other resulted in a rapid shift in the level of radioactivity in the juice. In the secretin-stimulated juice, the time course of the juice:plasma radioactivity ratios observed after injection of [^{3}H]D-sorbital and ^{45}Ca were almost parallel. In the cerulein-stimulated juice, the ^{45}Ca ratios were at first lower than the corresponding [^{3}H]D-sorbital ratios. After 30 min they rose to very high values, the increase being followed by the appearance of newly synthesized [^{3}H]L-leucine-labeled proteins. The pancreatic tissue was rich in calcium, which was localized primarily in the zymogen granules and mitochondria; the soluble cytoplasm was low in calcium. The injected ^{45}Ca accumulated in the zymogen granules faster than the [^{3}H]L-leucine-labeled proteins. The ^{45}Ca:protein ratio of these organelles was considerably lower than that of the cerulein-stimulated juice. It is concluded that: 1) calcium is secreted into the pancreatic juice in two fractions, one associated with the electrolyte component, and the other with the juice protein; 2) zymogen granules are the major source of the latter fraction; and 3) the zymogen granule-associated calcium joins the exportable proteins some time after their synthesis.

2563 CALCIUM AND PANCREATIC SECRETION. I. SUBCELLULAR DISTRIBUTION OF CALCIUM AND MAGNESIUM IN THE EXOCRINE PANCREAS OF THE GUINEA PIG. *(E.)* Clemente, F.; Meldolesi, J. (Cent. Cytopharmacol., Natl. Res. Counc., Milan, Italy). *J. Cell. Biol.* 65(1):88-102, 1975.

Combined cytochemical and cell fractionation techniques were used to study the intracellular distribution of calcium in the guinea pig pancreas. Pancreatic homogenates and cell fractions from fasted male albino guinea pigs were assayed for calcium, magnesium, protein, cytochrome c oxidase, trypsin, and chymotrypsin. Most of the magnesium was associated with the rough microsomes (probably bound to the ribosomes) and the postmicrosomal supernatant of the acinar cells. Calcium was distributed among all particulate fractions, primarily the mitochondria, microsomes (especially smooth surfaced), zymogen granules, and the plasmalemma; it was found in low concentrations in the postmicrosomal supernatant. Most of the calcium recovered from the particulate reactions was membrane bound, the highest concentrations found in the membranes of the zymogen granules and in the plasmalemma. In control experiments, ^{45}Ca was added to the homogenization fluid during cell fractionation to determine the total amount of calcium artifactually adsorbed by each fraction. The results indicated that a considerable redistribution of calcium occurs during homogenization and cell fractionation. At least some of the resulting artefacts were estimated quantitatively and corrected calcium concentration data were obtained by subtracting the adsorbed calcium from the total calcium of the various fractions. The biochemical results were confirmed using the cytochemical antimonate technique carried out on the tissue and on isolated fractions. The results indicate that at least some of the calcium bound to the zymogen granule membrane might have a role in anchoring the membrane to the granule content, in preventing the activation of proteolytic zymogens within the granules, and in switching the conditions for the activation of the proteolytic zymogens from unfavorable, as in the zymogen granules, to favorable, as in the intestinal lumen.

2564 EXOCRINE PANCREATIC FUNCTION IN PROTEIN-DEFICIENT PATAS MONKEYS STUDIED BY MEANS OF A TEST MEAL AND AN INDIRECT PANCREATIC FUNCTION TEST. *(E.)* Gyr, K.; Wolf, R. H.; Imondi, A. R.; Felsenfeld, O. (Tulane Univ. Delta Primate Res. Cent., Covington, La.). *Gastroenterology* 68(3):488-494, 1975.

The influence of moderate protein deficiency and depletion on the exocrine pancreas was investigated in patas monkeys. Base line pancreatic function tests were performed while male and female monkeys were maintained on an adequate diet. Subsequently, they were put on a protein-free diet, and pancreatic function was again measured when the serum albumin had dropped to 2.8 g/100 ml or less. Pancreatic function was estimated by measuring enzymatic activities in the duodenal contents after a test meal and by determination of the urinary excretion of *p*-aminobenzoid acid (pancreatic function test) after oral ingestion of the chymotrypsin-labile peptide *N*-benzoyl-L-tyrosyl-*p*-aminobenzoic acid. The plasma proteins decreased rapidly during the first 2 weeks on the protein-free diet, after which the globulin concentration leveled off at 2.9 g/100 ml. The albumin level continued to drop slowly, reaching 2.8 g/100 ml after 13.8 weeks. In five animals, protein deficiency caused no clinical symptoms except weight loss. In the other four monkeys, anorexia and hair loss were noted; two of these animals died and both showed atrophy of the pancreatic acinar cells. Significant decreases in the trypsin, lipase, amylase, and chymotrypsin activities of the duodenal samples were observed during protein deficiency. The urinary excretion of *p*-aminobenzoic acid was also significantly reduced. The two tests of pancreatic function correlated well. The data indicate that exocrine pancreatic secretion can be seriously impaired even at a moderate level of protein deficiency and that it may not always be reversible. Therefore, function tests must be evaluated with caution when hypoproteinemia is present.

2565 SECRETION OF IMMUNOREACTIVE GASTRIN FROM THE ISOLATED, PERFUSED CANINE PANCREAS.

(E.) Rehfield, J. F.; Iversen, J. (Bispebjerg Hosp., Copenhagen, Denmark). *Horm. Metab. Res.* 6(4):260-264, 1974.

The concentration of immunoreactive gastrin was measured radiochemically in the perfusate from 11 perfusions of the isolated canine pancreas using rabbit antibodies raised against synthetic human gastrin. In 9 of 11 perfusions the concentration of immunoreactive gastrin was measurable (basal level, 7 pM/liter). During 10 min perfusions with arginine hydrochloride (1 mM/liter) and acetylcholine (10 µM/liter), immunoreactive gastrin concentrations rose to 4.5 and 7 pM/liter above the basal level, resp. Infusion of atropine in a concentration of 25 µM/liter prior to and during 2 infusions with acetylcholine lowered immunoreactive gastrin concentration from 8.4 to 5.0 pM/liter. Atropine did not prevent the stimulation of immunoreactive gastrin release by acetylcholine (10 µM/liter for 10 min). Alteration of glucose concentrations in the perfusion medium from 1.4 to 8.3 and later to 16.7 mM/liter had no effect on immunoreactive gastrin concentrations. Epinephrine (10 nM/liter) did not stimulate immunoreactive gastrin secretion. It was concluded that immunoreactive gastrin is present and may be released from the canine pancreas in response to cholinergic and aminogenic stimuli.

2566 CHRONIC ALCOHOLISM AND THE GASTRIN PHASE OF PANCREATIC SECRETION. *(Fr.)*

Palasciano, G.; Tiscornia, O. M.; Dzieniszewski, J.; Teixeira, A. S.; Cavarzan, A.; Sarles, H. (Res. Unit Gastrointest. Dis., INSERM, Marseille, France). *Biol. Gastroenterol. (Paris)* 7:209-213, 1974.

The effect of 15% ethanol (1.3 g/kg p.o. through a stomach tube) on pancreatic secretion was studied in 3 dogs which had been given alcohol (2 g/kg/day p.o. through a stomach tube) for 2 yr and in 5 controls. All the dogs had gastric and duodenal fistulas. The gastric fistula was left open during the experiments to prevent the gastric contents from entering the duodenum. When pancreatic secretion was stimulated with secretin (1.0 U/kg/hr) and cholecystokinin-pancreozymin (3.0 U/kg/hr), infused simultaneously i.v., acute administration of ethanol significantly increased the pancreatic protein output in both groups of dogs. The protein output increased 70.9% in alcohol-fed dogs and 46.0% in controls. Increases also occurred in the volume of secretion, bicarbonate output, and protein concentration. Increases in the volume of secretion and the protein concentration were only significant for alcohol-fed dogs, while the increase in bicarbonate output was not significant in either group. The findings in this and previous studies suggest that increased secretion of pancreatic proteins, which is characteristic of the alcoholic pancreas, is due more to increased release of cholecystokinin-pancreozymin than to release of gastrin.

2567 EFFECTS OF CHRONIC ALCOHOLISM ON THE SYNTHESIS OF PANCREATIC ENZYMES IN THE RAT BEFORE AND AFTER ENDOGENOUS STIMULATION OF SECRETION.

(Fr.) Dagorn, J. C.; Figarella, C.; Michel, R.; Sarles, H. (Res. Unit Gastrointest. Dis., INSERM, Marseille, France). *Biol. Gastroenterol. (Paris)* 7:201-208, 1974.

The rate of pancreatic enzyme synthesis and pancreatic enzyme activities were measured in water- and alcohol-fed fasting male Wistar CF rats given balanced and high-fat diets after pancreozymin-like stimulation by p.o. instillation of 2 ml oleic acid. Amylase, lipase, and potential chymotrypsin activities were measured on supernatant from pancreatic homogenates, and the rate at which ^{14}C-valine was incorporated into total pancreatic protein was measured on the homogenates themselves. Alcoholic rats received 20% alcohol *ad libitum* in place of drinking water for 2 or 8 months and either a high-fat or balanced diet. Before oleic acid stimulation the rate at which pancreatic proteins were synthesized was essentially the same in alcoholic and water-fed rats given balanced or high-fat diets, but the activities of all 3 pancreatic enzymes were increased in alcoholic rats. The rate of protein synthesis decreased significantly in alcoholic rats fed a high-fat diet 60 min after administration of oleic acid. This decrease was observed after 2 months of a high-fat diet but was more pronounced after 8 months. No significant change in the rate of protein synthesis occurred in the remaining 3 groups of rats (high-fat diet and water, balanced diet and water, and balanced diet and alcohol) after oleic acid stimulation. The decrease which occurred in pancreatic enzyme activity after oleic acid stimulation was less pronounced in alcoholic rats than in those given water, but this difference was not significant. Changes in the rate of pancreatic protein synthesis appear to be preceded by changes in the response of the pancreas of alcoholic rats to stimulation, confirming results obtained previously on dogs.

2568 PANCREATIC ACINAR CELLS: IONIC DEPENDENCE OF ACETYLCHOLINE-INDUCED MEMBRANE POTENTIAL AND RESISTANCE CHANGE.

(E.) Nishiyama, A.; Peterson, O. H. (Inst. Med. Physiol. C, Univ. Copenhagen, Denmark). *J. Physiol. (Lond.)* 244(2): 431-465, 1975.

Current-voltage relations and the effect of ion replacements on the potential and resistance changes evoked by adding acetylcholine to the bathing fluid of isolated segments of mouse pancreas were investigated by injecting rectangular de- or hyperpolarizing current pulses through the recording microelectrode. Within a relatively wide range (-20 to -70 mV) there was a linear relation between injected current and change in membrane potential. The slope of such linear curves corresponded to an input resistance of about 3-8 MΩ. The membrane time constant was about 5-10 msec. Acetylcholine depolarized the cell membrane and caused a marked reduction of input resistance and time constant. The minimum latency of the acetylcholine-induced depolarization (applied locally to pancreatic acini by micro-iontophoresis) was 100-300 msec. Maximal depolarization was about 20 mV. The effect of this local acetylcholine application was abolished by atropine (1.4 x 10^{-6} M). The blocking effect of atropine was fully reversible. Replacing the superfusion fluid Cl by sulfate or methylsulfate caused an initial short-lasting depolarization. The amplitude of the acetylcholine-induced depolarization was enhanced in this state. Replacing extracellular Na by Tris caused an initial short-lasting hyperpolarization. In the steady state the resting potential was slightly lower than normal. The depolarizing effect of acetylcholine was immediately reduced as was the acetylcholine-induced change in resistance. Adding ethylene glycol-bis-(β-amino ethyl ester)N,N'-tetro acetic acid to a normal Na-containing Ca-free solution depolarized the cell membrane by about 5-10 mV and reduced the input resistance. Acetylcholine still evoked marked depolarization and reduction of input resistance. Omitting K from the superfusion fluid caused a slight cell membrane hyperpolarization. Acetylcholine caused a marked depolarization and resistance reduction. Readmitting K to a K-free solution after several hr of K deprivation caused a very marked hyperpolarization (20-30 mV) not accompanied by any change in input resistance or time constant. It is concluded that acetylcholine acts on the acinar cells by increasing the conductance of the plasma membrane to Na and K and possibly also to other ions. There is, however, no evidence for an acetylcholine-induced change in membrane Ca conductance. The importance of extracellular Ca may be the control of the $P_{Na}:P_K$ ratio.

2569 EFFECT OF AGE AND LONG-TERM DIET ON EXOCRINE PANCREAS OF THE RAT.

(E.) Snook, J. T. (Dep. Hum. Nutr. Food, Cornell Univ., Ithaca, N.Y.). *Am. J. Physiol.* 228(1):262-268, 1975.

The effects of age and diet on rat pancreas enzyme and nucleic acid levels were analyzed in experiments designed to investigate pancreas composition and function between weaning and senescence, and possible factors responsible. Male Charles River rats were maintained on commercial cereal chow, were fed a stimulatory test diet of 15% whole egg protein for 1 week prior to killing by chloroform, and the pancreas was extracted. Pancreas weight, nucleic acid levels and pancreatic enzyme levels were measured. Pancreas weight declined from 0.78% at 4 weeks to 0.35% at 1 yr as a proportion of body weight. At 28 months, average body weight was 200 g less than that of 19-month-old rats while pancreas weight and total DNA were significantly greater compared to 12-month-old rats. Pancreatic lipase, chymotrypsinogen and trypsinogen were reduced more than 65% in 28- as compared to 12-month-old rats; amylase had disappeared. The decline in enzymes occurred sometime after 19 months. In the second experiment semipurified diets high in sucrose, starch or butterfat were fed to rats from 9-24 months of age. The physiological condition of rats in the fat and sucrose group appeared poorer than 28-month-old rats in the first experiment. The high fat diet rats had significantly less chymotrypsinogen and trypsinogen than 9-month-old control groups, while the sucrose, starch and 9-month-old control groups did not differ significantly in total enzyme content. Enzyme concentrations were generally lower in aged rats; this was compensated for by increase in pancreas size. Digestion of whole egg protein (3 g/day) was not impaired even in rats with a 50-70% reduction in total pancreatic protease, in agreement with previous findings that a decrease in the functional reserve capacity of the pancreas may not be of metabolic significance.

2570 EFFECTS OF CHRONIC ETHANOL ADMINISTRATION ON CANINE EXOCRINE PANCREATIC SECRETION. FURTHER STUDIES.

(E.) Tiscornia, O.; Palasciano, G.; Sarles, H. (Res. Unit Dig. Pathol., INSERM, Marseille, France). *Digestion* 11(3/4):172-182, 1974.

Ethanol-induced modifications of pancreatic secretion in the dog were studied up to one year's exposure. Five dogs were given chronic pancreatic fistulae, the accessory duct ligated in each case, and Thomas cannulas were inserted into the stomach. After an 18 hr fast the major pancreatic duct was cannulated and the secretion collected at 20 min intervals. Ethanol and secretin (1.0 CU/kg/hr) alone or combined with cholecystokinin (3.0 U/kg/hr) were infused into the saphenous veins. After standardization, 2.0 g/kg 50% ethanol in isotonic saline was administered by the gastric cannula at the same hr daily. Pancreatic secretory response to acute i.v. ethanol infusion was determined by two methods. In one, under continuous perfusion of secretin, a 1.3 g/kg infusion of ethanol was followed by daily intragastric administration of 2.0 g/kg of ethanol. Pancreatic response to the same conditions was retested at 3 and 6 months. In the other method, under continuous perfusion of secretin and cholecystokinin a 1.3 g/kg ethanol infusion was given. Changes induced by chronic alcohol feeding on the plateau pancreatic secretory values were evaluated, with secretin alone or with secretin and cholecystokinin, at 6 weeks, and 3, 9, and 12 months. Pancreatic juice determinations included flow rate, and the outputs and concentrations of bicarbonate, pretein, and lipase. Acute i.v. ethanol inhibited all constituents of exocrine pancreatic juice during the non-alcoholic stage in both experiments, but more markedly with secretin alone than when it was combined with cholecystokinin. The effects were greater on protein and lipase than the alkaline components; secretin alone resulting in a fall of bicarbonate output of 42.2% 40 min after ethanol injection while protein and lipase fell 73.5% and 61.2%, resp. Secretin and cholecystokinin resulted in a fall of bicarbonate output to 21.6% after 60 min, while protein and lipase 27.0% and 33.0%, resp. After 3 months ethanol injection no longer caused any significant inhibition. After 12 months, the effects were reversed, and almost all parameters showed significant increases. Chronic alcohol feeding with secretin alone caused an increase in bicarbonate concentration after 3 months. By 12 months, concentration and output of protein and lipase were significantly depressed. With secretin and cholecystokinin, at 6 weeks, 3, 9, and 12 months, volume and bicarbonate output were higher than during the non-alcoholic period. Protein values rose and after 12 months dropped to pre-treatment values. Lipase values also diminished after 12 months. It is concluded that chronic alcohol feeding as opposed to acute causes an inversion of exocrine pancreatic response and modifies plateau levels of secretion in response to secretin to cholecystokinin.

2571 SUBCUTANEOUS SECRETIN IN DOGS: INFLUENCE OF SOLVENT AND VOLUME OF SOLVENT. *(E.)*

Verine, H. J.; Grossman, M. I. (VA Wadsworth Hosp. Cent., Los Angeles, Calif.). *Acta Hepatogastroenterol.* (Stuttg.) 22(1):35-40, 1974.

The effects of the solvents carboxymethylcellulose and gelatin on the magnitude and duration of action of s.c. secretin were tested. Three dogs were given a Thomas cannula and a pancreatic fistula at least a month before the experiment. The dogs were fasted for 18 hr, and 5.6 or 2.8 U/kg secretin were injected s.c. under the loose skin of the neck at one of three sites (2 ml/site). The secretin was dissolved in either 0.001 M HCl-saline, 16% gelatin, or 10% carboxymethylcellulose. Each of the 12 combinations of doses, solvents, and volumes of solvent were tested on separate days, one time in each of the three dogs. During each test the dogs received a continuous i.v. saline infusion (24 ml/hr). The volume of pancreatic juice was recorded every 10 min, and bicarbonate concentration was determined by titration. Peak output was not significantly related to the dose, solvent or solvent volume, but the time at which peak output occurred was related to dose and solvent. The peak occurred at 56 min with the 75 U dose, and at 74 min with the 150 U dose; and occurred at the earliest with saline and at the latest with gelatin. Duration of secretion at over 75% of peak was for 20-30 min with saline, but lasted for 90 min with gelatin or carbomethylcellulose. This was dependent on dose (49% greater with 150 U than with 75) and on solvent (84% greater with gelatin and 29% greater with carboxymethylcellulose than with saline). Duration of total response was 25% longer with the higher dose; 84% longer with gelatin and 36% longer with carboxymethylcellulose than with saline; and 27% longer with 6 ml than with 2 ml. Total bicarbonate output was 38% greater with the higher dose, 38% greater with gelatin and 10% greater with carboxymethylcellulose than saline, and 17% greater with the larger volume. It is concluded that carboxymethylcellulose, and to a greater extent gelatin, greatly enhance the magnitude and length of response to s.c. secretin.

2572 ELECTROPHORETIC CHARACTERIZATION OF PORCINE PANCREATIC (PRO)ELASTASES A AND B. *(E.)*

Ledoux, M.; Lamy, F. (Fac. Med., Univ. Sherbrooke, Canada). *Can. J. Biochem.* 53(4):421-432, 1975.

Two porcine pancreatic zymogens (proelastases A and B) and the products of their activation by trypsin were characterized by polyacrylamide-gel electrophoresis, and the effect of these proelastases and trypsin on elastin was studied. The proelastases were purified and separated by free electrophoresis on a sucrose gradient. After activation by trypsin, both enzymes were able to completely hydrolyze elastin. Proelastase B, but not A, also had an esterolytic activity towards *N*-acetyl-L-tyrosine ethyl ester. To further identify the products of activation of proelastases A and B, the products were tagged with radioactive diisopropylfluorophosphonate and separated by polyacrylamide-gel electrophoresis. Proelastase A gave only one active species, pancreatopeptidase E, but three distinct proteins were obtained from proelastase B; one of the products of activation of B had the same mobility as its precursor. Elastases A and B exhibited a synergism when acting together on an elastin preparation from which the microfibrils were removed; a smaller degree of synergism was noted when an alkaline-treated elastin was used as substrate, and there was only a slight synergism when a commercial elastin preparation was used. There was little additional synergism when trypsin was added to mixtures of A and B, and there was no synergism noted when chymotrypsin was added to mixtures of A and B. The results indicate that although elastase B resembles α-chymotrypsin, it is a different enzyme; similarly, it is unlikely that proelastase B is the same as chymotrypsinogen B or C.

2573 PANCREATIC DUCT ABRASION AND SELECTIVE ASPIRATION OF SECRETION — EXPERIMENTS IN DOGS. *(E.)*

Weidenhiller, S.; Stolte, M.; Koch, H.; Schwamberger, K.; Flugel, H. (Dep. Med., Univ. Erlangen-Nuremberg, Erlangen, Germany). *Endoscopy* 7 (1):10-17, 1975.

A method of abrading the pancreatic duct to obtain fresh cellular material for diagnosis is presented. Nine dogs were laparotomized and the duodenum opened. A size three Fogarty catheter was inserted into the main pancreatic duct as far as possible. After injection of 2 IU/kg secretin, and pancreatic secretion through the papilla, the balloon of the catheter was partially expanded and drawn through a short section of duct several times. In three dogs the stimulated secretion was aspirated with the abraded material by means of a 20 ml syringe through a Teflon tube covering the catheter, and was centrifuged and stained. In all dogs, the balloon was inflated and drawn through the entire length of the duct several times. The air pressure was adjusted in different cases to vary the strength of abrasiveness from gentle to aggressive. The balloon was deflated, withdrawn, and rolled on glass slides which were subsequently treated with Pappenheim's stain. Four dogs were sacrificed immediately, one at four days, one at seven days, and three dogs at three weeks, and the pancreatic duct fixed, stained and examined by light microscopy. Intubation of the duct and aspiration of secretion was successful in all cases. In both aspirate and smear preparations, large numbers of connected duct epithelial cells as well as individual cells were obtained. Macroscopically, none of the ducts showed any pathological changes. Microscopically, the ducts of the dogs sacrificed immediately showed the layer of columnar epithelium had been almost completely abraded, but the continuity of the basement membrane was intact. Four days after the abrasion, the duct was lined completely with narrow cylindrical cells, easy to differentiate, and with occasional fine gaps between them. After seven days the cells were further matured and more compactly united. Of two dogs given gentle abrasion, one after three weeks showed incomplete layering of the regenerated epithelium, fine gaps, and multiple broad defects between cells, but in the other the duct epithelium was completely regenerated and intact. Another dog, three weeks after aggressive abrasion, showed epithelium almost indistinguishable from normal. It is concluded that good cytological material for diagnosis can be obtained successfully by this method of duct abrasion, and that the epithelium will be regenerated within three weeks.

2574 EXPERIMENTAL CONTRIBUTION TO THE STUDY OF PANCREATIC POLYSERITIS. TRANSDIAPHRAGMATIC AND LYMPHATIC DIFFUSION OF TRYPSIN.

(Fr.) Warter, J.; Storck, D.; Warter, A. (Univ. Hosp. Cent., Strasbourg, France). *C. R. Soc. Biol. (Strasburg)* 108(6/7):860-865, 1974.

Intra- and retroperitoneal injections of trypsin alone, trypsin and Chinese ink, and Chinese ink in physiological solution were administered to rats (type unspecified) in order to determine the zones of passage of trypsin from the peritoneum into the pleural cavities. Both intra- and retroperitoneal injection of trypsin alone produced hemorrhagic overflow in the peritoneum and the pleura, with radial hemorrhage striation on both sides of the diaphragm but more intensely on the peritoneal side. There was intense vascular congestion in the subperitoneal space and on the intestinal chorion, cell lysis at the apex of the villi, edema, and subserosal hemorrhage. Such lesions are evidence of the direct transdiaphragmatic passage of trypsin injected into the peritoneum. Injection of trypsin with Chinese ink into the peritoneal cavity produced dyeing of the areas seen to be affected by injection of trysin alone. Also dyed were were the ganglia of the superior mediastinum; the fringes of the omentum; the Kupffer cells; the mesothelial cells of the peritoneum; the diaphragmatic, parietal, and visceral pleura; and the alveolar sacs in the lungs. This provides evidence of lymphatic and pleuro-pulmonary paths for resorption. Injection of trypsin and Chinese ink into the pleural cavity confirmed that trypsin does not pass from the pleura into the abdomen, although it is resorbed by a pleuropulmonary path. Injection of Chinese ink in physiological solution provides confirmation of the lymphatic resorption of trypsin and Chinese ink from both the peritoneal and pleural cavities.

2575 EFFECT OF A SOYBEAN DIET ON ENZYME CONTENT AND ULTRASTRUCTURE OF THE RAT EXOCRINE PANCREAS.

(E.) Folsch, U. R.; Winckler, K.; Wormsley, K. G. (Dep. Med., Univ. Gottingen, Germany). *Digestion* 11(3/4):161-171, 1974.

The enzyme content and ultrastructure of exocrine pancreas was studied in rats fed raw soybean flour with active trypsin inhibitor, or heat-inactivated soybean flour. Two groups of five Wistar rats each were fed a diet containing either raw or heat-inactivated soybean flour for 20 days, while controls were fed a standard diet containing 42% carbohydrates, 19% protein, and 4% fat. After 20 days, all rats were killed following a 24 hr fast. Electron microscopic studies were done on pancreatic tissues from eight additional rats, given the same diets as above, but given in addition a 7.5 or 60 IU/kg/hr dose of cholecystokinin with a 0.5 CU/kg/hr dose of secretin for 4 hr before histological examination. The tissues were fixed in Karnowsky's solution, postfixed in 1% osmium tetroxide, and stained with toluidine blue for light microscopy, or uranyl acetate and lead citrate for electron microscopy. The pancreas was removed, weighed, homogenized, and analyzed for trypsin, amylase, lipase, and protein. The net weight of the pancreas/100 g body weight in the rats fed raw soybean flour was double that in those fed either heat-inactivated flour or standard diet. The latter two did not differ significantly. The raw flour-fed rats showed a significantly higher protein content (404 mg/pancreas), than standard diet-fed (161 mg) or heat-inactivated-fed rats. Amylase activity (4707 U/total pancreas) was significantly less in rats given the inactivated flour, than those given the standard diet (13,190 U) or given raw flour (11, 773). Activity of trypsin and lipase was significantly greater in inactivated flour-fed rats (19,403 and 5806, resp.) than standard diet-fed rats (9331 and 1642, resp.). Total pancreatic content of amylase and trypsin was greater in raw flour fed rats than inactivated flour-fed rats, but total lipase content did not vary significantly. Electron microscopy of tissues from rats not given exogenous hormones showed greatly increased numbers of zymogen granules in the acinar cells of the rats fed raw flour.

These were found in the basal as well as the apical parts of the cells. The rats on the other two diets showed no morphological changes. The rats on standard or inactivated diets showed a marked diminution in acinar cell zymogen granule content. The acinar cells of the raw flour-fed rats showed as many granules as non-hormone stimulated standard and inactivated-fed rats. It is concluded that raw soybean flour increases the total protein content by increasing enzyme and non-enzyme proteins; but except for an increase in the number of zymogen granules, cellular structures are not altered.

2576 ALCOHOL AND THE PANCREAS. *(E.)* Wheatley, I. C.; Waterworth, M. W.; Barbezat, G. O.; Bank, S.; Marks, S.; Hichman, R.; Terblanche, J. (Dep. Surg., Univ. Cape Town, South Africa). *S. Afr. J. Surg.* 12(4):202-203, 1974.

2577 ENTEROPANCREATIC CIRCULATION OF AN INTACT DIGESTIVE ENZYME. *(E.)* Liebow, C.; Rothman, S. S. (no affil.). *Fed. Proc.* 33(3):409, 1974.

2578 SYNTHETIC PEPTIDES SPANNING THE ENTIRE SEQUENCE OF PORCINE PANCREATIC SECRETORY TRYPSIN INHIBITOR II (KAZAL). *(E.)* Rocchi, R.; Benassi, C. A.; Guarneri, M.; Guggi, A.; Tomatis, R. (Inst. Pharm. Chem. Toxicol., Univ. Ferrara, Italy). *Int. J. Pept. Protein Res.* 6(6):391-395, 1974.

2579 CYCLIC AMP AND PANCREATIC BICARBONATE SECRETION IN DOGS. *(Ger.)* Domschke, S.; Konturek, S. J.; Domschke, W.; Demling, L. (Med. Clin., Univ. Erlangen-Nuremberg, Erlangen, Germany). *Z. Gastroenterol.* 12(Suppl.):421, 1974.

2580 STIMULATION OF THE EXOCRINE PANCREAS BY INTRADUODENALLY ADMINISTERED ALBUMIN AND AN ALBUMIN HYDROLYZATE IN HUMANS. *(Ger.)* Dollinger, H. C.; Goebell, H. (Cent. Intern. Med. Pediatr., Univ. Ulm, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:856-859, 1973.

2581 A PANCREATIC RIBONUCLEASE ACTIVE AT pH 4.5. *(E.)* Batholeyns, J.; Moore, S.; Stein, W. H. (Rockerfeller Univ., New York, N.Y.). *Int. J. Pept. Protein Res.* 6(6):407-417, 1974.

2582 NON-CONSTANT EVOLUTION RATES IN AMINO ACID SEQUENCES OF GUINEA PIG, CHINCHILLA AND COYPU PANCREATIC RIBONUCLEASES. *(E.)* van den Berg, A.; Beintema, J. J. (Biochem. Lab., Rijksuniv., Groningen, Netherlands). *Nature* 253(5488):207-210, 1975.

2583 EXOCRINE PANCREAS FUNCTION IN THE RAT: INHIBITION BY LARGE DOSES OF CCK-PANCREOZYMIN AND ANESTHESIA. *(Ger.)* Hotz, J.; Neumann, K.; Ziegler, R.; Goebell, H. (Dep. Intern. Med., Univ. Ulm, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:862-865, 1973.

2584 EXPERIENCES WITH A NEW TEST OF EXOCRINE PANCREATIC FUNCTION IN PROTEIN DEFICIENT PATAS MONKEYS. *(E.)* Gyr, K.; Wolf, R. H.; Imondi, A. R.; Felsenfeld, O. (Clin., Med. Univ. Basel, Switzerland). *Schweiz. Med. Wochenschr.* 104(50):1888-1889, 1974

2585 RESPONSE OF PANCREATIC SECRETION IN DOGS WITH CHRONIC ALCOHOLISM TO DOSES OF SECRETIN AND CHOLECYSTOKININ. *(Fr.)* Tiscornia, O. M.; Palasciano, G.; Sarles, H. (Res. Unit. Gastrointest. Dis., INSERM, Marseille, France). *Biol. Gastroenterol. (Paris)* 7(4):319-320, 1974.

2586 CHRONIC ALCOHOLISM AND THE GASTRIN PHASE OF EXOCRINE PANCREATIC SECRETION IN THE RAT. *(Fr.)* Cavarzan, A.; Teixeira, A. S.; Palasciano, G.; Dzieniszewski, J.; Tiscornia, O. M.; Sarles, H. (Res. Unit. Gastrointest. Dis., INSERM, Marseille, France). *Biol. Gastroenterol. (Paris)* 7(4):318, 1974.

2587 EFFECT OF THE CHRONIC ADMINISTRATION OF ALCOHOL ON THE ENZYME SYSTEMS WHICH METABOLIZE ETHANOL. *(Fr.)* Clemente, F.; Thouvenot, J. P.; Ribet, A. (Purpan Hosp., Toulouse, France). *Biol. Gastroenterol. (Paris)* 7(4):319, 1974.

2588 EFFECT OF ADRENERGIC AGENTS ON CIRCULATION AND BASAL AND STIMULATED PANCREATIC SECRETION IN THE DOG. *(Fr.)* Vaysse, N.; Pascal, J. P.; Fourtanier, G.; Roux, P.; Martinel, C.; Ribet, A. (Purpan Hosp., Toulouse, France). *Biol. Gastroenterol. (Paris)* 7(4):316, 1974.

2589 VARIATIONS IN THE INTRACELLULAR CONTENT OF CYCLIC AMP PRODUCED BY HORMONES PROMOTING PANCREATIC SECRETION IN THE RAT. *(Fr.)* Cailla, H. L.; Reggio, H.; Delaage, M.; Marchis-Mouren, G. (Cent. Biochem. Mol. Biol., CNRS, Marseille, France). *Biol. Gastroenterol. (Paris)* 7(4):317, 1974.

2590 FOOD-INDUCED CONTROL OF A SPECIFIC HORMONE SYSTEM IN THE DUODENAL MUCOSA WHICH REGULATES PANCREATIC SECRETION. *(Fr.)* Felber, J. P.; Zermatten, A.; Dick, J. (Canton. Hosp., Lausanne, Switzerland). *Biol. Gastroenterol. (Paris)* 7(4):321-322, 1974.

2591 THE SECRETION OF RECENTLY SYNTHESIZED PROTEINS BY THE HUMAN PANCREAS. *(Fr.)* Robberecht, P.; Cremer, M.; Deltenre, M.; Christophe, J. (Fac. Med., Free Univ., Brussels, Belgium). *Biol. Gastroenterol. (Paris)* 7(4):320, 1974.

2592 DOG PANCREATIC ARGININE ESTERASES, SPONTANEOUSLY ACTIVATED ON DEAE-SEPHADEX. *(E.)* Hojima, Y.; Yamashita, M.; Moriya, H. (Fac. Pharm. Sci., Univ. Tokyo, Japan). *Chem. Pharm. Bull.* 23(1):225-228, 1975.

2593 ENDOGENOUS PROTEIN KINASE IN THE MEMBRANE OF SECRETORY GRANULES IN THE PANCREAS. *(Fr.)* Lambert, M.; Camus, J.; Christophe, J. (Fac. Med., Free Univ., Brussels, Belgium). *Biol. Gastroenterol. (Paris)* 7(4):321, 1974.

2594 IDENTIFICATION OF ENZYMES IN HUMAN PANCREATIC JUICE ON POLYACRYLAMIDE GEL. *(Fr.)* de Caro, A.; Clemente, F.; Guy, O.; Figarella, C. (Res. Unit Gastrointest. Dis., INSERM, Marseille, France). *Biol. Gastroenterol. (Paris)* 7(4):318-319, 1974.

See also, 2404, 2534, 2812, 2816.

SECRETION AND METABOLISM

Hepatobiliary Tract

2595 DRUG INDUCTION OF HEPATIC GLUTATHIONE S-TRANSFERASES IN MALE AND FEMALE RATS. *(E.)* Kaplowitz, N.; Kuhlenkamp, J.; Clifton, G. (Nav. Reg. Med. Cent., Oakland, Calif.). *Biochem. J.* 146(2): 351-356, 1975.

The induction of the glutathione S-transferases by phenobarbital and polycyclic aromatic hydrocarbons was studied in male and female rats in order to examine similarities between these enzymes and ligandin, and also to identify a potentially inducible cytosolic enzyme system of importance in drug metabolism. Sprague-Dawley rats were given phenobarbital (2-8 mg in 0.9% NaCl) and 3,4-benzopyrene or 3-methyl-cholanthrene (1 mg in corn oil i.p. twice a day). The animals were killed 24 hr after the last dose; liver homogenates were prepared and centrifuged, then the supernatant fractions (cytosol) were collected for study. Administration of phenobarbital resulted in 60-80% increase in S-aryl and S-aralkyl enzyme specific activities, whereas the S-epoxide and S-alkyl activities were increased by 30-40%. In following the sequence of induction, the former 2 activities reached peak activities before an increase in the latter 2 activities was observed. Both 3-methylcholanthrene and 3,4-benzopyrene induced these 4 enzymic activities, but to a lesser degree than did phenobarbital (with the exception of S-epoxide activity). Significantly lower enzyme specific activities were found for 3 of the activities studied in female rats but no difference observed in S-alkyltransferase activity; however, the proportional increase in the enzymic activities in response to phenobarbital was the same in males and females. The findings demonstrate the inducibility of 4 glutathione S-transferase activities by phenobarbital and the 2 polycyclic aromatic hydrocarbons, and they further support the possibility that ligandin is part of the group of glutathione transferases.

2596 PROTECTION OF RATS AGAINST THE HEPATOTOXIC EFFECT OF PARACETAMOL. *(E.)* Gazzard, B. G.; Hughes, R. D.; Portmann, B.; Dordoni, B.; Williams, R. (King's Coll. Hosp. Med. Sch., London, England). *Br. J. Exp. Pathol.* 55(6):601-605, 1974.

The effectiveness of a number of agents against the hepatic damage caused by paracetamol was studied in rats. With the exception of the control group, all the animals received phenobarbitone (1 g/liter) in their drinking water and paracetemol (2.5 g/kg) *via* an intragastric tube immediately following the administration of the protective agents under study: i.v. glutathione (40 mg/kg); propranolol (40 mg/kg); thioctic acid (5 mg/kg); p.o. cysteamine (300 mg/kg); i.p. cysteamine (300 mg/kg); i.p. α-tocopherol acetate (400 mg/kg). Livers were removed 48 hr after administration of agents for histological assessment and determination of cytochrome P-450. The paracetamol-induced liver damage with corresponding reduction in levels of cytochrome P-450 was completely prevented by the oral cysteamine. The levels of cytochrome P-450 were maintained following i.p. α-tocopherol, but it had less effect on the histological evidence of liver damage. Glutathione, propranolol, and thioctic acid did not prevent liver damage, although the number of areas of necrosis (believed to be the result of infarction) was reduced except with glutathione. It was concluded that the degree of protection against liver damage afforded by the agents under study cannot be explained until the mode of action of the reactive metabolite of paracetamol is further understood.

2597 EFFECTS OF HYPOPHYSECTOMY OF LIVER DONOR ON NET SYNTHESIS OF SPECIFIC PLASMA PROTEINS BY THE ISOLATED PERFUSED RAT LIVER. MODULA-

TION OF SYNTHESIS OF ALBUMIN, FIBRINOGEN, α_1-ACID GLYCOPROTEIN, α_2-(ACUTE PHASE)-GLOBULIN, AND HAPTOGLOBIN BY INSULIN, CORTISOL, TRIIODOTHYRONINE, AND GROWTH HORMONE.

(E.) Griffin, E. E.; Miller, L. L. (Univ. Rochester Sch. Med. Dent., N.Y.). *J. Biol. Chem.* 249(16):5062-5069, 1974.

The isolated adult male Sprague-Dawley rat liver perfused for 12 or 24 hr was used to study effects of total hypophysectomy of the liver donor, and of added cortisol, bovine growth hormone, insulin, and triiodothyronine on the net biosynthesis of 5 specific plasma proteins. Cortisol (5 mg) was added to the perfusion medium at the outset and by continuous infusion (a total of 10 mg) during the 24-hr period. Two of the other 3 hromones were added with the cortisol in the following quantities: insulin, 5 U initially and 13.6 U by infusion; growth hormone, 0.5 mg and 2 mg; and triiodothyronine, 2 μg and 4 μg. Plasma proteins released into the perfusion medium were measured by the single radial diffusion technique. With all 4 hormonal supplements, livers from fed hypophysectomized rats perfused at pH 7.10 synthesized about 50% less albumin than livers from normal donors while synthesis of fibrinogen, acid glycoprotein, and haptoglobin was close to that observed in normals. Fibrinogen synthesis in the absence of triiodothyronine was not different from that with the 4 hormones; however, deletion of either insulin or growth hormone resulted in a small but significant decrease in net synthesis below that seen with the 4 hormones. Deletion of either triiodothyronine, growth hormone, or insulin was associated with failure to increase synthesis of haptoglobin above that seen in the absence of all hormones at 12 hr, and at 24 hr was only 50% of that with all 4 hormones. In the absence of hormone supplements, synthesis of α_2-(acute phase)globulin by livers from hypophysectomized donors was undetectable. With all 4 hormones, synthesis of this protein was not significantly different from that by livers of normal donors. Omission of either triiodothyronine, insulin, or growth hormone diminished the net synthesis of the protein in a manner similar to that observed with haptoglobin. Omission of insulin or growth hormone caused a small but significant decrease in net uptake of free amino acid nitrogen. The absence of insulin was associated with increased urea production, negative nitrogen balance, and reduced incorporation of L-[1-^{14}C]leucine into hepatic protein. It is concluded that the regulation of the synthesis of several acute phase plasma proteins in livers from hypophysectomized rats is qualitatively and quantitatively as sensitive to the hormones tested as in livers from normal rats, the synthesis of α-acid glycoprotein being an exception because it is maximal in livers from hypophysectomized rats and is not further increased by hormones.

2598 COMPARATIVE STUDY OF THE ABSORPTION, ELIMINATION AND ACUTE HEPATOTOXIC ACTION OF ETHANOL IN GUINEA PIGS AND RATS.

(E.) Strubelt, O.; Siegers, C. P.; Breining, H. (Med. Univ., Lubeck, Germany). *Arch. Toxicol. (Berl.)* 32(2):83-95, 1974.

The hepatotoxic effects and kinetics of ethanol were studied in male guinea pigs and Wistar rats. In fed guinea pigs, an oral dose of 6.4 g/kg of ethanol given as a 40% solution (v/v) produced a maximal blood alcohol level of 6.8 mg/ml, whereas in fed rats, blood alcohol levels after the same dose did not exceed 2.1 mg/ml. Maximal blood alcohol levels in fasted animals occurred 1-4 hr after an oral load of 4.8 g/kg of ethanol and were 6.3 mg/ml in guinea pigs and 3.7 mg/ml for rats. However, i.v. injected ethanol (1 g/kg) was eliminated at the same rate in both species (275 mg/kg/hr), and alcohol dehydrogenase activity of the liver related to body weight was 20% greater in guinea pigs than in rats. Therefore, absorption of ethanol occurred at a much slower rate in rats than in guinea pigs. This is possibly due to the fact that high ethanol concentrations strongly delay emptying of the rat stomach. Lowering the ethanol concentration accelerated absorption rate in the rat. However, even after gavage of a 10% solution, peak levels of blood alcohol were still lower by 36% in rats than in guinea pigs. In guinea pigs, increased activities of SGOT, SGPT, and glutamate dehydrogenase occurred after an oral dose of 4.8 g/kg or 6.4 g/kg of ethanol, resp. SGOT increased after 1.6 g/kg of ethanol p.o. After 6.4 g/kg of ethanol given to rats serum transaminase levels increased only slightly, and glutamate dehydrogenase activity not at all. Vacuolar degeneration was the morphological substrate of ethanol-induced liver damage in guinea pigs and rats. In guinea-pigs, it occurred after 1.6 g/kg of ethanol, whereas in rats only after 6.4 g/kg. It is concluded that the guinea pig is more suitable than the rat as a model for alcohol toxicity.

2599 DETERMINATION OF BILE ACID POOL SIZE IN MAN: A SIMPLIFIED METHOD WITH ADVANTAGES OF INCREASED PRECISION, SHORTENED ANALYSIS TIME, AND DECREASED ISOTOPE EXPOSURE.

(E.) Duane, W. C.; Adler, R. D.; Bennion, L. J.; Ginsberg, R. L. (Phoenix Indian Med. Cent., Ariz.). *J. Lipid Res.* 16(2):155-158, 1975.

A simplified method is described for estimating the bile acid pool size in man. The procedure, studied in 26 healthy volunteers aged 19-34, involves either i.v. or intragastric infusion of 1-5 μCi ^{14}C- or 3-15 μCi ^{3}H-cholic acid 6 hr after a light supper. Contents from the descending duodenum are withdrawn by tube the next morning following stimulation of gallbladder contraction with protein hydrolysate. Total bile acid pool size (P_T) is calculated from total bile acid concentration (B_T), the radioactivity administered (dpm_A) and the concentration of radioactivity in the bile acids (dpm_T) according to the formula: $P_T = dpm_A\ (B_T/dpm_T)$. The precision of this method (±2.6%), which is not influenced by the route of administration of cholic acid nor by the type of radioactive label, compares favorably to that of the Lindstedt method (±7.9%). Other advantages over the Lindstedt method include the requirement for only one duodenal intubation and the necessity of using only 12.5-25% of the radionuclide dose. In 16 comparisons, pool size measured 13.7% higher by this method than by the Lindstedt procedure, a difference predicted by extrapolation of the cholic acid specific activity of the Lindstedt method to time zero.

2600 STUDIES ON UREA CYCLE ENZYMES IN RAT LIVER DURING ACUTE URAEMIA. *(E.)* Hoppe-Seyler, G.; Maier, K. P.; Schollmeyer, P.; Frohlich, J.; Talke, H.; Gerok, W. (Dep. Intern. Med., Univ. Freiburg, Germany). *Eur. J. Clin. Invest.* 5(1):15-20, 1975.

Urea cycle enzyme activities were measured in female albino Sprague-Dawley rats 12 and 48 hr after ligature of both renal pedicles. After 12 hr, ornithine carbamyl transferase specific activity of liver homogenates was elevated by 30% whereas, after 48 hr, specific activities of both this and argininosuccinic acid synthetase were increased by 55% and 33%, resp. Activities of argininosuccinic acid lyase, glutamic-aspartic-transaminase, glutamic-alanine-transaminase and ornithine-δ-amino-transferase were unaffected except for a 50% decrease after 48 hr in ornithine-δ-amino-transferase. Except for the decrease in ornithine-δ-amino-transferase, changes in activities of the other enzymes were not so marked as seen during prolonged starvation. Based on previous findings which failed to detect changes in liver ornithine concentration in the uremic state, it is concluded that the present results are not consistent with the concept that accelerated urea production in the liver of acutely uremic rats is due to increased liver ornithine concentration secondary to decreased ornithine-δ-amino-transferase activity.

2601 MULTIPLE HEPATIC EXCRETORY MECHANISMS FOR ORGANIC ANIONS. A STUDY WITH SUCCINYLSULFATHIAZOLE AND TAUROCHOLATE IN THE RAT. *(E.)* Bailey, D. G.; Johnson, G. E. (Dep. Pharmacol., Univ. Toronto, Canada). *Can. J. Physiol. Pharmacol.* 53(1): 97-103, 1975.

The interactions during biliary excretion of succinylsulfathiazole and taurocholate were studied in male Wistar rats. Following infusion of ^{14}C-succinylsulfathiazole (100 mg/kg) or ^{3}H-taurocholate (56 mg/kg) separately over a 3-5 min period, all of the taurocholate but only about 10% of the succinylsulfathiazole was excreted in the bile over 40 min. Concomitant administration of the 2 substances reduced the amounts of taurocholate and succinylsulfathiazole excreted into the bile to 81% and 8%, resp., after 40 min. Bile flow rate was increased about 1.5-fold following administration of either substance alone and about 3-fold when both were given together. Bile concentration of ^{3}H-taurocholate was significantly less (18.9 mg/g wet weight) in animals receiving both substances than in those receiving only taurocholate (28.0 mg/g). Bile succinylsulfathiazole concentration was similarly reduced in rats given taurocholate simultaneously. Concomitant administration of either substance did not affect the binding of the other to plasma proteins. These results are consistent with the presence of a single liver-to-bile transport system for the 2 substances although they are in contrast to previous reports which showed an increase in biliary excretion of acidic compounds in animals given taurocholate. It is thus suggested that more than one transport system for biliary excretion of organic anions may exist.

2602 EXPERIMENTS WITH 1-^{14}C-ACETATE ON THE LIPID METABOLISM OF HUMAN LIVER BIOPSIES AND THEIR DEPENDENCE UPON THE DIETARY FAT CONTENT. *(Ger.)* Oette, K.; Phlippen, R.; Lanckohr, H. (Med. Clin., Cologne Univ., Germany). *Res. Exp. Med. (Berl.)* 162(2):83-103, 1974.

The lipid metabolism from 1-^{14}C-acetate and esterification was studied in human liver biopsies from patients with diseases other than liver cirrhosis. The patients were kept on special diets for 6 days prior to biopsy. The fatty acid synthesis and the esterification patterns of synthetized fatty acids were inversely dependent on the fat-carbohydrate content of the diet. By increasing the dietary fat content, fatty acid neosynthesis ceased almost completely at 55 cal%. The remaining activity was believed to be mainly due to chain elongation products. The activity of the enzyme system for fatty acid neosynthesis decreased slowly within 3 to 6 days. Most of the radioactivity appeared in the long-chain fatty acids with chain lengths over 16 carbon atoms. Fatty acids with not more than 10 carbon atoms accounted for 12% of the total activity. The rate of radioactivity uptake in the liver lipids was highest in normal diet, and lowest at dietary fat contents of 0-5 cal% and 55 cal%. The relative cholesterol content was substantially higher following fat-rich diet than after low-fat diet. The fatty acids synthesized at dietary fat contents ranging from 0 to 40 cal% were distributed rather evenly among glycerides and phosphatides. Low rate of synthesis in chronic hepatitis under low-fat diet was observed. The rate of 1-^{14}C-acetate incorporation in the total lipids with extremely reduced uptake in the phosphatides was measured in a patient with alcohol-induced fatty liver. The findings indicate that the composition of the liver glycerides is essentially determined by the acylase activities, and that 1-^{14}C-acetate tests are suitable for the determination of the suppression of the fatty acid neosynthesis in high-fat diet, which is practically complete at 50 cal% fat, but not for the study of the fatty acid neosynthesis in low-fat diet due to isotope dilution.

2603 PRODUCTION OF THE FEATURES OF REYE'S SYNDROME IN RATS WITH 4-PENTENOIC ACID. *(E.)* Glasgow, A. M.; Chase, H. P. (Univ. Colorado Med. Cent., Denver). *Pediatr. Res.* 9(3):133-138, 1975.

Male Sprague-Dawley rats were injected with pentenoic acid in an attempt to reproduce the features of Reye's syndrome. All rats given a single i.p. injection of 200 mg/kg purified pentenoic acid died within 1 hr. Mean plasma ammonia levels were elevated about 4-fold in rats allowed free access to food and about 6-fold in 2 of the 20-hr fasted rats following 200 mg/kg pentenoic acid. Fasted rats also responded with hypoglycemia and 3 rats developed mild acidosis. Chronic administration of pentenoic acid (50 mg/kg every 4 hr x 10, then 200 mg/kg i.p. once) resulted in slight weight loss, elevation of SGOT and blood urea nitrogen and decreased free fatty acid levels but no change in blood glucose, Na^{+} or total bilirubin. Livers from treated rats showed extensive fatty degeneration but no evidence of necrosis, inflammation or bile stasis. It is concluded that pentenoic acid, an analog of hypoglycin, produces findings similar to those of Reye's syndrome and to Jamaican vomiting sickness.

2604 INFLUENCE OF HYDROCORTISONE ON BLOOD CLOTTING AND FIBRINOLYSIS AFTER A STANDARD RESECTION OF THE LIVER IN DOGS.

(E.) Hafstrom, L.; Lede, R.; Stehlin, J. S.; Brown, R. O. (St. Joseph Hosp., Houston, Tex.). *Surg. Gynecol. Obstet.* 139 (6):860-866, 1974.

Standard liver resection was carried out on 19 mongrel dogs. A group of 7 dogs was treated with hydrocortisone, 50 mg given before operation, 50 mg after, and 50 mg i.m. daily for 4 days. Another group of 7 dogs was given no hydrocortisone. A group of 5 dogs was also treated with hydrocortisone, 200 mg before and after the surgical procedure and 200 mg i.m. daily for 4 days after the operation. Three dogs were subjected to a sham procedure. Blood samples were taken before and after resection, and used for the tests on blood coagulation and fibrinolysis. There was no difference in blood clotting and fibrinolysis between the group treated with 50 mg hydrocortisone and the untreated group. Of the 14 dogs in these 2 groups, 6 had a prolonged activated partial thromboplastin time on the day of resection and 2 the day after the resection. On the other hand, none of the 5 dogs given 200 mg hydrocortisone had a prolonged activated partial thromboplastin time. The causes of the prolonged activated partial thromboplastin time after hepatic resection were decreased synthesis, increased fibrinolysis without consumption, release of anticoagulative factors, and local or general intravascular coagulation. Evidence of inhibitory substances was found in 3 dogs. There was no effect of hydrocortisone on the post-operative mortality rate after liver resection. These results suggest that large doses of hydrocortisone before and after resection can prevent a prolongation of activated partial thromboplastin time after resection but the possible negative effects of hydrocortisone on the regenerative process and on metabolism should be considered.

2605 RAPID TRANSESTERIFICATION OF BILIRUBIN GLUCURONIDES IN METHANOL.

(E.) Salmon, M.; Fenselau, C.; Cukier, J. O.; Odell, G. B. (Johns Hopkins Univ. Sch. Med., Baltimore, Md.). *Life Sci.* 15(12):2069-2078, 1974.

The rapid transesterification of bilirubin conjugates exposed to methanol was studied. Rat bile, washed with hexane and chloroform and lyophilized, was separated on thin layer chromatography into two major components. Glucuronic acid and bilirubin were present in the faster moving spot in a molar ratio of 0.96:1, and in the slower in a 2.01:1 ratio. Conversion of the slow running spot to sulfanilyazo derivatives yielded one class of derivatives on cellulose and silica gel plates suggesting that the two halves of the bilirubin molecule are identically conjugated. The faster spot was converted to two classes of sulfanilylazo derivatives separable by thin layer chromatography, suggesting that only half of the tetrapyrrole is conjugated. Based on these and further analyses, the two major components of the washed bile were identified as the mono- and diglucuronide conjugates of bilirubin. Characterization of the transesterification products formed after solution in methanol for 2 hr revealed dimethyl and monomethyl bilirubin. The conjugates of bilirubin and their methyl esters were isolated by thin layer chromatography and the isolates were chemically quantitated for their bilirubin and glucuronic acid composition. Characterization of the bilirubin methyl esters was performed by mass spectrometric analysis of the trimethylsilyl and phenylazo derivatives. Additional confirmation of the assignment of the dimethyl diester structure to the major product of transesterification by methanol was obtained by comparison to the authentic dimethyl diester of bilirubin. Ultraviolet absorption curves were identical and mass spectra were similar with very small molecular ion peaks at m/e 612 and major peaks at m/e 227, 241, 300, and 313. These results are significant in understanding hepatic excretion of bilirubin. Solvent partitioning of polar conjugates of bilirubin in bile have frequently employed methanol and chloroform. Because of the *in vitro* capacity of glucuronides of bilirubin to undergo transesterification in methanol, the resulting methyl esters would be preferentially recovered in the apolar chloroform layer. Subsequent chemical analysis by diazo reaction would lead to both a qualitatively and quantitatively erroneous interpretation of the excretion of unconjugated bilirubin in bile, as the methyl esters of bilirubin have the same reaction requirements as unconjugated bilirubin with diazotized sulfanilic acid, ethyl anthranilate and phenyl diazonium chloride. Such transesterification may contribute to differences noted by workers in the amounts of free, mono-, and diglucuronides of bilirubin recovered in bile. This reaction offers an alternative to transamination for the characterization of conjugates of bilirubin.

2606 KINETIC PROPERTIES OF BABOON LIVER ALKALINE PHOSPHATASE.

(E.) Balinsky, D.; Hammond, K. D.; Bershon, I.; Jersky, J. (South African Inst. Med. Res., Johannesburg). *S. Afr. J. Sci.* 70(2):61-62, 1974.

The kinetic properties of alkaline phosphatase purified from the livers of baboons were studied following auxiliary liver transplant. Michaelis constants for p-nitro-phenylphosphate at pH 9.0 and 10.2 and for phenolphthalein monophosphate at pH 9.9 were 0.044, 0.44 and 2.71 mM, resp. Enzyme activity was inhibited by ethylenediaminetetraacetic acid, L-cysteine and L-histidine and was stimulated by Mg^{++} ions. In addition, several other amino acids exhibited uncompetitive inhibition possibly by inhibiting breakdown of the phosphoryl-enzyme complex. Isoelectric focusing in polyacrylamide gels showed an isoelectric point of pH 4.3-4.6. The enzyme showed 50% inactivation at 58 C after 32 min. These properties were similar to those of human alkaline phosphatase with the exception of thermostability and isoelectric point.

2607 ACETAMINOPHEN-INDUCED HEPATIC NECROSIS. V. CORRELATION OF HEPATIC NECROSIS, COVALENT BINDING AND GLUTATHIONE DEPLETION IN HAMSTERS.

(E.) Potter, W. Z.; Thorgeirsson, S. S.; Jollow, D. J.; Mitchell, J. R. (Lab. Chem. Pharmacol., Natl. Inst. Health, Bethesda, Md.). *Pharmacology* 12(3): 129-143, 1974.

The relationships between hepatic glutathione depletion, arylation of hepatic macromolecules *in vivo* and *in vitro* and hepatic necrosis were studied after administration of acetaminophen to hamsters. Animals treated with 3-methylcholanthrene (40 mg/kg i.p.) for 3 days followed by acetaminophen (150-300 mg/kg) 24 hr later showed an increase in incidence and severity of liver necrosis. Treatment with phenobarbital (75 mg/kg), piperonyl butoxide (0.8 ml/kg), and cobaltous chloride (50 mg/kg) followed by acetaminophen (300-425 mg/kg) caused a decrease in incidence and severity of liver necrosis. Diethyl maleate (0.4 ml) was administered to deplete endogenous hepatic glutathione followed 30 min later with acetaminophen (200-425 mg/kg); both the severity of necrosis and mortality rate increased. None of the pretreatments appeared to alter absorption of acetaminophen, but piperonyl butoxide decreased its rate of disappearance in plasma, phenobarbital increased its rate of disappearance, and 3-methylcholanthrene had little effect on its plasma concentration. When ^{3}H-acetaminophen (300 mg/kg) was used, the amount of covalently bound metabolites of acetaminophen found in the liver paralleled the severity of the liver necrosis. Covalent binding of radiolabel to hamster microsomes was dependent on NADPH and O_2 and inhibited by a specific antibody against purified NADPH cytochrome c reductase. In hamsters pretreated with 3-methylcholanthrene, hepatic concentration of glutathione was depleted to 10% of normal 75 min after acetominophen. Piperonyl butoxide markedly decreased and phenobarbital moderately decreased the glutathione depletion. The results support the hypothesis that acetaminophen-induced hepatic necrosis results from the metabolic activation of the drug to an arylating metabolite by cytochrome P-450 oxidases in the liver.

2608 EFFECT OF COLCHICINE ON COLLAGEN, ALBUMIN AND TRANSFERRIN SYNTHESIS BY CIRRHOTIC RAT LIVER SLICES.

(E.) Rojkind, M.; Kershenobich, D. (Cent. Invest. Adv. Stud., Natl. Polytech. Inst., Mexico City, Mexico). *Biochim. Biophys. Acta* 378(3): 415-523, 1975.

The effect of colchicine and L-azetidine-2-carboxylic acid on liver function and collagen synthesis was studied in rats made cirrhotic by the chronic administration of CCl_4 (0.15 ml i.p. 3/week, 20 injections). The control group of rats was killed 24-48 hr after the last dose of CCl_4; the second group kept 30 days without further treatment; the third group treated with colchicine (10 μg/day intragastrically 5/week, 20 injections); the fourth group was treated with 10 μM L-azetidine-2-carboxylic acip p.o. every other day for 12 doses. Histological examinations of the liver were made and the *in vitro* incorporation of ^{14}C-labeled proline into collagen and non-collagenous proteins was analyzed, and its incorporation into albumin and transferrin. Liver function in rats receiving CCl_4 was impaired as evidenced by high values of serum albumin; incorporation of radioactive proline into collagen hydroxyproline was greatly enhanced. In animals treated with colchicine, a 50% inhibition in proline incorporation into collagen hydroxyproline was observed and the amount of conjugated bilirubin was 0.49 mg/100 ml. Transferrin biosynthesis remained constant in both cirrhotic and colchicine liver slices. Rats treated with L-azetidine-2-carboxylic acid during the 30-day period following CCl_4 showed a slight but not significant improvement in liver function; collagen synthesis and extent of fibrosis were similar to controls. The results show that the administration of colchicine to cirrhotic animals was accompanied by an improvement in liver function; thus, colchicine may be clinically useful in treating human patients with liver cirrhosis.

2609 TRANSIENT LIQUID CRYSTALS IN HUMAN BILE ANALOGUES.

(E.) Holzbach, R. T.; Marsh, M. (Cleveland Clin. Found., Ohio). *Mol. Cryst. Liquid Cryst.* 28(2):217-222, 1974.

The process of phase transition and equilibration was studied by phase separation microscopy in 30 bile analog systems differing in relative lecithin:bile salt concentrations. Although not observed in the systems in which lecithin concentration was less than 14%, those with lecithin concentrations between 14-30 M% developed a liquid crystalline mesophase which gradually developed into cholesterol microcrystallites. The transition times for development of the cholesterol crystals were a function of the lecithin concentration, ranging from 7 days for 14-18 M% to 21 days for 22-30 M%. Solutions containing lecithin from 35-65 M%, concentrations which exceed that allowing for maximum cholesterol solubility, remained turbid due to a persistent mesophase. Fresh human bile specimens from patients with gallstones, which contained more cholesterol crystals than specimens from normal subjects, underwent spontaneous transition phenomena identical to those seen in the compositionally similar bile analog solutions. It is concluded that a transient crystalline mesophase observed in human bile is seen in physiologically relevant lipid concentrations.

2610 EFFECT OF BILIARY STASIS AND HEPATOTOXINS ON THE EXCRETION OF IOPANOATE IN THE RAT.

(E.) Cooke, W. J.; Berndt, W. O.; Mudge, G. H. (Dartmouth Med. Sch., Hanover, N.H.). *J. Pharmacol. Exp. Ther.* 192(3):618-629, 1975.

The renal and biliary excretion of the cholecystographic compound iopanoic acid was analyzed in male Sprague-Dawley rats in the presence of hepatic dysfunction induced with several agents and after biliary obstruction produced surgically. Hepatic dysfunction was induced with CCl (1 or 2 mg in corn oil p.o., 18 or 20 hr prior to the experiment, SKF 525-A (25 mg/kg i.v. 30 min prior to iopanoate administration), taurolithocholic acid (5 mg/ml in 0.15 M NaCl containing 10% bovine serum albumin in an infusion started 30 min before and completed 15 min after iopanoate injection, and d-napthyliosthiocyanate (100 mg/kg in 1.5% carboxymethylcellulose p.o. 18 or 20 hr prior to the experiment) and by acute and chronic surgical ligation of the bile duct. Biliary and urinary excretion of ^{125}I-labeled iopanoate was measured after a total dose of iopanoate of 5 mg/kg was given i.v. over a 2-min period. In the absence of normal biliary excretion, the amount of iopanoate excreted in the urine varied from 0.25-11.2% of the dose, with highest rates of urinary excretion occurring after α-naphthylisothiocyanate and chronic stasis. Drug disposition was further determined by tissue analysis of liver and kidney. The results indicate that, for a drug that is normally almost exclusively excreted by the bile, in the presence of hepatic dysfunction the amount excreted by the alternate route depends on the type of the induced hepatic disorder. It is concluded that the intrarenal distribution of ^{125}I-radioactivity is strongly influenced by its plasma concentration rather than just by the rate of excretion in the urine.

2611 BIOSYNTHESIS OF BILE ACIDS IN MAN. HYDROXYLATION OF THE C_{27}-STEROID SIDE CHAIN.

(E.) Bjorkhem, I.; Gustafsson, J.; Johansson, G.; Persson, B. (Dep. Chem., Karolinska Inst., Stockholm, Sweden). *J. Clin. Invest.* 55:478-486, 1975.

The mechanisms of side chain degradation in the biosynthesis of bile acids in man were studied by analyzing hydroxylations of the side chain of different C_{27}-steroids catalyzed by the mitochondrial and microsomal fractions of liver homogenates from 14 patients with various disease (cholelithiasis, 1; carcinoma of the pancreas, 1; carcinoma of the stomach, 2; chronic myelocytic leukemia, 2; Hodgkin's disease, 2; agranulocytosis, 1; hereditary spherocytosis, 1; pheochromocytoma, 1; lymphosarcoma, 1; intoxication with tricyclic antidepressants, 1; and head injury, 1). Liver tissues were homogenized within 5-30 min after excision of the sample. The microsomal fraction was obtained from the homogenate by centrifugation at 800 g, 20,000 g and 100,000 g. The microsomal pellet was resuspended in the homogenizing medium and homogenized before incubation. The mitochondrial fraction was obtained by resuspension in 0.25 M sucrose of the pellet obtained after centrifugation at 20,000 g and recentrifugation at 8500 g for 12 min. In standard incubations with the microsomal fractions, 250 μg of the steroid, dissolved in 50 μl of acetone, was incubated with 1.5 ml of the microsomal fraction in a total volume of 3 ml of the homogenizing medium. In standard incubations with the mitochondrial fraction, 100 μg of the steroid dissolved in 50 μl of acetone was incubated with 1.0 ml of the mitochondrial fraction in a total volume of 3 ml of the homogenizing medium. Incubations were performed at 37 C for 20 min and were terminated by the addition of 20 vol of chloroform-methanol. The chloroform extract was evaporated and subjected to thin-layer chromatography. The microsomal fraction catalyzed an efficient 25-hydroxylation of 5 β-cholestane-3α, 7α, 12α-triol. A small extent of 23-, 24-, and 26-hydroxylation of the same substrate was observed. 5 β-cholestane-3α, 7α-diol was hydroxylated in the 25-position only to a very small extent. The mitochondrial fraction catalyzed 26-hydroxylation of cholesterol, 5-cholestene-3β, 7α-diol, 5β-cholestane-3α, 7α-diol, 7α-hydroxy-4-cholesten-3-one, and 5β-cholestane-3α,7α,12α-triol. Addition of Mg^{++} stimulated the 26-hydroxylation of cholesterol but had no effect or an inhibitory effect on 26-hydroxylation of the other substrates, indicating a heterogeneity of the mitochondrial 26-hydroxylating system. The level of 26-hydroxylase activity towards different substrates varied considerably with different mitochondrial preparations. The results indicate that microsomal 26-hydroxylation is less important than mitochondrial 26-hydroxylation under normal conditions; the possibility that microsomal 25-hydroxylation is important cannot be ruled out.

2612 ACETAMINOPHEN-INDUCED HEPATIC NECROSIS. VI. METABOLIC DISPOSITION OF TOXIC AND NONTOXIC DOSES OF ACETAMINOPHEN.

(E.) Jollow, D. J.; Thorgiersson, S. S.; Potter, W. Z.; Hashimoto, M.; Mitchell, J. R. (Natl. Heart Lung Inst., Bethesda, Md.). *Pharmacology* 12(4/5):251-271, 1974.

The relation between the metabolic disposition of acetaminophen and the susceptibility of male golden Syrian hamsters, male GP mice, and male Sprague-Dawley rats to acetaminophen-induced liver necrosis was examined. Animals were allowed food and water *ad libitum*. Some were treated daily with i.p. doses of phenobarbital (80 mg/kg for 3 days) or 3-methylcholanthrene (20 mg/kg for 2 days). Other animals received piperonyl butoxide (hamsters, 800 mg/kg, mice 1360 mg/kg, and rats 800 mg/kg) i.p. 30 min before acetaminophen. Animals received various doses of acetaminophen (25-1200 mg/kg i.p.) dissolved in 0.9% saline solution. ^{3}H-acetaminophen was added to the dose so that each animal received 100 μCi/kg. Metabolites of acetaminophen excreted in the urine were separated by thin layer chromatography and identified by mass spectrometry. The fraction of low doses of acetaminophen converted to the mercapturic acid metabolite was highest in the most susceptible species (hamster, mice) and lowest in the more resistant species (rat). Pretreatment regimens known to potentiate the hepatotoxicity of acetaminophen increased mercapturic acid formation whereas treatments which protect from liver damage decreased mercapturic acid formation. The data suggest that the activity of the mercapturic acid-forming pathway *in vivo* reflects the activity of the hepatotoxic pathway. As the dose of acetominophen was increased to hepatotoxic levels, the fraction of the dose excreted as the mercapturic acid decreased markedly, commensurate with the known depletion of hepatic glutathione under these conditions. It is suggested that the normal metabolic intermediate which conjugates with glutathione in the mercapturic acid pathway is also the electrophilic metabolite which in the absence of glutathione arylates hepatic macromolecules and causes cell death.

2613 EFFECTS OF CHRONIC INGESTION OF SOME LOWER ALIPHATIC ALCOHOLS IN RATS.

(E.) Hillblom, M. E.; Franssila, K.; Forsander, O. A. (Res. Lab. State Alcohol Monop., Helsinki, Finland). *Res. Commun. Chem. Pathol. Pharmacol.* 9(1):177-180, 1974.

The possibility that n-propanol or isobutanol may be more toxic than ethanol was tested by giving diluted (1 M) solutions of ethanol, n-propanol, or isobutanol to 4-month old male Wistar rats for their sole drinking fluid for 4 months. Ordinary laboratory chow containing about 26% of the calories as protein, 55% as carbohydrate, and 19% as fat was provided *ad libitum*. At the end of the test period the animals were decapitated and their livers weighed. Formalin-fixed liver secretions were stained with hematoxylin and eosin, toluidine blue, the periodic acid Schiff reaction with and without diastase, and Weigert-van Gieson, and evaluated under a light microscope. The amounts of ethanol and n-propanol consumed remained almost constant from beginning to end of the experiment, but the consumption of isobutanol increased significantly. A lower ratio of weight gain to caloric intake was seen in the rats given n-propanol indicating that this group utilized food less efficiently than the ethanol-treated group. The mechanism by which n-propanol interferes with food utilization is unknown. Rats treated with isobutanol had enlarged gas- and/or food-filled stomachs, and some animals had signs of small intestinal bleeding and constipation. Since the increase in isobutanol consumption was accompanied by slight increases in total caloric and fluid intakes, it is speculated that isobutanol somehow disturbed food absorption from the gastrointestinal tract. The absence of liver abnormalities in the ethanol-treated animals is attributed to the fact that the amount of ethanol consumed was not enough to produce fatty, cirrhotic, or fibrotic lesions in the liver. It is suggested that n-propanol and isobutanol are not more harmful to the rat liver than ethanol when administered p.o. for periods of several weeks to several months. The daily doses of congeners in this animal experiment greatly exceeded those generally consumed in hard liquors and wine by heavy drinkers. The duration of exposure, however, was much shorter. No extrapolation, therefore, to the situation in man can be made and the relative hepatotoxicity of the main congeners as compared to ethanol in humans remains unresolved.

2614 INFLUENCE OF PRIMARY BILE ACID FEEDING ON CHOLESTEROL METABOLISM AND HEPATIC FUNCTION IN THE RHESUS MONKEY.

(E.) Webster, K. H.; Lancaster, M. C.; Hofmann, A. F.; Wease, D. F.; Baggenstoss, A. H. (VA Hosp., Alburquerque, N.M.). *Mayo Clin. Proc.* 50(3):134-138, 1975.

Studies were performed to define the effect of feeding cholic acid or chenodeoxycholic acid (in doses similar to those used for gallstone therapy in man) on cholesterol metabolism, liver function, and liver morphology in the rhesus monkey. After a 5-week equilibration period, 4 of 10 monkeys were killed for bile collection and the remaining 6 used for the metabolic study. Labeled cholesterol was given i.v., and cholesterol pool size and turnover rates were determined by an isotope dilution technique for the 10-week study period. After these initial studies, 3 animals received chenodeoxycholic acid p.o. (both 20 mg/kg/day) for an additional 15 weeks. In the monkeys fed chenodeoxycholic acid, there was no consistent increase in the total exchangeable cholesterol pool or input to the cholesterol pool. In the 3 monkeys fed cholic acid, the total exchangeable pool increased in all animals and input to the cholesterol pool increased in 2. SGPT increased transiently in 2 animals in each group. Morphologic abnormalities (triaditis with atypical ductular proliferation) were noted in 1 animal; this animal was ingesting chenodeoxycholic acid but had normal liver test results at the time of biopsy. Biliary bile acids contained 8-14% lithocholic acid in the chenodeoxycholic acid group and 48-72% deoxycholic acid in the cholic acid group. The present study is the third to show that chenodeoxycholic acid administration does not expand the exchangeable cholesterol pool or increase serum cholesterol levels in primates, including man. During bile acid feeding, the ratio of secondary to primary bile acids is greater in the rhesus monkey than in gallstone patients. The reason for the increased proportion of secondary bile acid is unknown. The simplest explanation is that increased input of 7 α-dehydroxylated bile acids occurs in the monkey, presumably in the cecum. It is also possible that intestinal conservation may be more efficient in the monkey. Chenodeoxycholic acid appears to be less hepatotoxic in man than in the rhesus monkey. Whether the hepatotoxicity is caused by increased lithocholate input of altered lithocholate disposition is unclear. It is also not clear whether these findings are invariably true in the rhesus monkey or merely reflect an abnormality in the intestinal flora of the 3 animals used in this study.

2615 ASPECTS OF BILE SECRETION IN THE RABBIT.

(E.) Rutishauser, S. C. B.; Stone, S. L. (Dep. Physiol., Univ. Coll., Cardiff, Wales). *J. Physiol. (Lond.)* 245(3):567-582, 1975.

The effects of a dihydroxy and a trihydroxy bile salt were compared in anesthetized rabbits in which hepatic bile was collected by cannulation of the common bile duct. The animals were anesthetized either with pentobarbitone (30 mg/kg in 0.9% NaCl injected into an ear vein) or with urethane (5 ml/kg of a 25% solution i.p.). Bile flow in the group anesthetized with urethane was significantly lower than that in the group anesthetized with pentobarbitone sodium. The concentration of bile salt in bile was significantly higher in the urethane group; this was associated with a higher biliary osmolality. I.p. injection of a hypertonic solution of sucrose (3 M) decreased bile flow and produced changes in the ionic composition of bile and of plasma. The biliary concentrations of sodium, potassium and bicarbonate all increased despite the fact that the plasma concentrations of these ions declined. The infusion of sodium taurodeoxycholate (1.5 - 20 μM/min i.v.) gave higher rates of bile flow than did equimolar infusions of sodium taurocholate, and unlike taurocholate, increased the bicarbonate concentration of bile. The choleretic efficiency of taurodeoxycholate decreased from about 50 ml/mM at an infusion rate of 20 nm/min/g liver to about 15 ml/mM at an infusion rate of 200 nM/min/g liver. On no occasion did the infusion of bile salt increase the osmolality of bile or of plasma. Both taurodeoxycholate and taurocholate increased the concentrations of sodium and bile salt in bile, and decreased the concentration of chloride. Taurodeoxycholate consistently increased the concentration of bicarbonate in bile, whereas taurocholate caused a net decrease in concentration. Acetazolamide (10-100 mg/kg) increased the concentration of bicarbonate both in bile and in plasma, and had little effect on bile flow. The infusion of BSP (5 mg/kg i.v.) decreased the excretion of bicarbonate into bile, and was associated with the formation of a hypotonic bile. It is concluded that the three anions studied, taurodeoxycholate, taurocholate, and BSP, differ in the effects that they have on the flow and composition of bile. If the anions differ in this way, then the factors limiting their secretion into bile may not be simply the availability of carrier site at the biliary membrane, but may be the prevailing conditions within the canaliculus itself.

2616 THE CHOLERETIC EFFECT OF IODIPAMIDE. *(E.)*

Feld, G. K.; Loeb, P. M.; Berk, R. N.; Wheeler, H. O. (Univ. California, San Diego, Sch. Med., La Jolla). *J. Clin. Invest.* 55:528-535, 1975.

Experiments were performed in 3 trained, unanesthetized dogs (prepared several months earlier by cholecystectomy and insertion of a Thomas cannula into the duodenum opposite the major duodenal papilla) to determine if the increased bile flow produced by the radiographic contrast medium, iodipamide, is canalicular or ductular in origin, to quantitate the choleresis associated with iodipamide and taurocholate excretion, and to correlate these findings with the results of *in vitro* studies in which the osmotic activities of iodipamide and taurocholate in both isotonic saline and bile were determined. A priming injection of 2.5 μCi of [^{14}C]erythritol dissolved in 70% ethanol was given, followed by a continuous infusion of 0.025 μCi/min. Two experiments were performed in each dog by infusion of a 15.3% solution of methylglucamine iodipamide in a stepwise fashion at 7 rates increasing from 0.33 to 7.33 μM/min/kg. Bile samples were collected at each infusion rate after bile flow had been stable for at least 30 min. Blood samples were collected at the midpoint of each bile collection period. In 2 additional studies, iodipamide was infused at the relatively low rate of 1.0 μM/min/kg. In these investigations iodine and [^{14}C]erythritol concentrations were measured in plasma and bile. In another experiment, a 1.5% solution of sodium taurocholate in distilled water was infused in a stepwise fashion at 4 rates increasing from 0.5 to 3.0 μM/min/kg in each of 2 dogs. Iodine and bile salt concentrations were measured in bile. The plasma erythritol clearance increased linearly with the excretion of iodipamide, indicating that iodipamide stimulates canalicular bile flow. The plasma erythritol clearance increased linearly with the excretion of iodipamide, indicating that iodipamide stimulates canalicular bile flow. The choleretic potency of iodipamide (22 ml/mM) was approximately 3 times that of taurocholate (7.8 ml/mM), yet the osmotic activity of iodipamide in bile (1.5 mOsm/mM) was only twice as great as that of taurocholate in bile (0.8 mOsm/mM). The results suggest that per unit of effective osmotic solute secreted, iodipamide carries appreciably more water and diffusible solute into the bile canaliculi than does taurocholate. The reason for this difference is not apparent but possible reasons might include stimulation of active inorganic solute transport by iodipamide, alteration of canalicular membrane permeability by iodipamide, differences in electrical potential associated with transport of iodipamide and taurocholate, delayed reduction in the osmotic activity of iodipamide, and differences between the spatial distribution of the canalicular secretion of iodipamide and taurocholate.

2617 EFFECT OF DEOXYCHOLATE ON THE PEROXIDE OXIDATION OF LIPIDS IN LIVER MICROSOMES.

(E.) Mishin, V. M.; Lyakhovich, V. V. (Novosibirsk State Med. Inst., USSR). *Biofizika* 19(1):83-86, 1974.

The interdependence between the structural organization of rat liver microsomes modified with a detergent (deoxycholate) and the maximum rate of peroxide oxidation of lipids was investigated. The rat liver microsomes were isolated from a liver homogenate (1 part liver tissue to 2.5 parts of 0.25 M sucrose plus 0.01 M Tris HCl buffer, pH 7.4) by centrifuging for 60 min at 105,000 r.p.m., followed by reprecipitation. The rate of peroxide oxidation of lipids was determined polarographically from the uptake of O$_2$. Deoxycholate was added to the assay medium before the introduction of the microsomes. Treatment of the rat liver microsomes with deoxycholate at 0.115-0.9 mg/mg microsomal protein increased the activity of peroxide oxidation of lipids dependent on ascorbate. At the same concentrations of deoxycholate the rate of enzymatic peroxidation of lipids dependent on NADP-H did not change. In the presence of deoxycholate there was a fall in the degree of inhibition of peroxide oxidation of lipids by phenergan and ethylene diamine tetraacetate. It is concluded that the degree of integration of the microsomal membrane regulates the processes of peroxide oxidation of lipids. Treatment of the microsomes with deoxycholate apparently increases the binding of Fe^{+++} to the membrane, and, as a consequence, increases the number of radical-forming centers. Large amounts of deoxycholate (greater than 0.7-0.9 mg/mg of microsomal protein) suppress the peroxide oxidation of lipids both of enzymatic and non-enzymatic nature. This is explained by spatial separation of the centers of radical formation and the reaction substrates.

2618 EFFECTS OF PHENOBARBITAL UPON BILE ACID SYNTHESIS IN TWO STRAINS OF RATS. *(E.)*

Cohen, B. I.; Raicht, R. F.; Nicolau, G.; Mosbach, E. H. (Public Health Res. Inst. City New York, Inc., N.Y.). *Lipids* 10(3):168-174, 1975.

The effect of phenobarbital on cholesterol 7α-hydroxylase activity and bile acid output in Wistar and Sprague-Dawley rats was measured. In addition, the amount of biliary cholic acid was correlated with the microsomal 12α-hydroxylase activity in phenobarbital-treated rats. The rats were injected with sodium phenobarbital (100 mg/kg body weight/day) for 8 days. Fecal bile acid excretion was measured on days 6 and 8, and biliary bile acid composition, hepatic microsomal cholesterol, 7α-hydroxylase, and 7α-hydroxy-4-cholesten-3-one 12α-hydroxylase were determined at the end of the experiment. In the Wistar rat, injection of phenobarbital produced a doubling of fecal bile acid output (controls, 5.3 mg/rat/day; treated rats, 10.6 mg/rat/day) and a two- to threefold increase in cholesterol 7α-hydroxylase (13.5 pM 7α-hydroxycholesterol formed/mg protein/min in treated rats; 5.8 pM protein/min in the controls). The fecal bile acid output of Sprague-Dawley rats increased 20% in response to phenobarbital (controls, 9.5 mg/rat/day; treated rats, 11.6 mg/rat/day). The activity of cholesterol 7α-hydroxylase remained unchanged. In both strains, phenobarbital treatment produced a decrease in the proportion of cholic acid in total biliary bile acids (controls, 85%; treated groups, 65%). This was associated with an approximately 50% decrease of 7α-hydroxy-4-cholesten-3-one 12α-hydroxylase activity. Biliary cholesterol concentrations were reduced in phenobarbital-treated rats of both strains, but liver cholesterol concentrations remained unchanged. The drug produced an average 25% increase in liver weight. These findings confirm the previously published suggestion that phenobarbital is potentially useful in the treatment of gallstones since it produces a significant lowering of the relative cholesterol concentration in the bile in treated animals; biliary cholesterol concentrations of treated rats of both strains were decreased significantly. It is further suggested that the *in vitro* assay of cholesterol 7α-hydroxylase activity reflects the state of bile acid synthesis *in vivo* and that the *in vitro* activity of the microsomal 12α-hydroxylase reflects the proportion of cholic acid present in the bile.

2619 COMPARATIVE EFFECTS OF SODIUM TAURODEOXYCHOLATE AND SODIUM TAUROCHOLATE ON BILE SECRETION IN THE RAT, DOG AND RABBIT.

(E.) Rutishauser, S. C. B.; Stone, S. L. (Dep. Physiol., Univ. Coll., Cardiff, Wales). *J. Physiol. (Lond.)* 245(3): 583-598, 1975.

The biliary effects of sodium taurodeoxycholate and sodium taurocholate were investigated in anesthetized mongrel dogs and male Wistar rats, and in the isolated perfused rat liver and compared with previously determined effects in rabbits. Sodium taurocholate and sodium taurodeoxycholate were dissolved in 0.9% NaCl (2.0 μM/ml) and were infused i.v. into 7 dogs at rates ranging from 5-120 nM/min g liver. Both bile salts had similar quantitative and qualitative effects on the flow and composition of bile in the dog. The choleretic efficiency of sodium taurocholate was 8.5 ml/mM and that for sodium taurodeoxycholate was 9.6 ml/mM. The bile salts were dissolved in 0.9% NaCl (25-50 μM/ml) and were infused at rates ranging from 20-200 nM/min g liver into anesthetized rats. The bile salts had similar effects on the ionic composition of bile in the rat, but differed in that bile flow was not always directly related to the rate of bile salt secretion in bile, in the experiments with sodium taurodeoxycholate. Sodium taurodeoxycholate was hydroxylated to form sodium taurocholate by the liver of the rat but not by that of the dog. These findings indicate that sodium taurodeoxycholate is not a more efficient choleretic than sodium taurocholate in the rat or dog. This contrasts with the choleretic effects of this bile salt in the rabbit and suggests that sodium taurodeoxycholate is not inherently a good choleretic, but rather that it possesses special properties in the rabbit. It seems that deoxycholate, which is the major bile salt present in rabbit bile, has an important and individual role to play in the formation of bile in the species.

2620 INTERACTION BETWEEN ANTIPYRINE AND THE MICROSOMAL ETHANOL OXIDATION IN RAT LIVER.

(E.) Andreasen, P. B.; Bremmelgaard, A.; Larsen, B. K. (Rigs Hosp., Copenhagen, Denmark). *Pharmacology* 12(4/5):244-250, 1974.

The effect of antipyrine on the kinetics of ethanol oxidation in isolated microsomes from female Wistar rat livers was investigated. The rats were fasted 16 hr, anesthetized with ether, the liver removed and the microsomes prepared by ultracentrifugation. The microsomes were homogenized and the pooled microsomes from 2 rat livers used in each experiment. The incubation system contained 1.8 μM NADPH, 50 μM $MgCl_2$, 43 μM DL-isocitrate, 0.2 mg protein of isocitrate dehydrogenase, microsomal protein 1 mg/ml, and phosphate buffer pH 7.4 to a final volume of 5 ml. Antipyrine was added to obtain a concentration of 0.1 or 1.0 mM/liter. The mixture was preincubated for 5 min and the reaction started by addition of ethanol. Samples were drawn for analysis by gas chromatography at 0 and 10 min after the start of the reaction. The maximal elimination rate and the half saturation concentration were estimated from Lineweaver-Burk plots by linear regression. The average estimated maximal elimination rate for microsomal ethanol oxidation was 117.0 nM/min/g liver and half saturation concentration was 12.7 nM/liter ethanol. When corrections for microsomal losses during the preparation procedure are considered, the estimated average maximal elimination rate is 292.5 nM/min/g liver. The estimated maximal elimination rate and the half saturation concentration for microsomal ethanol oxidation in the presence of antipyrine at a concentration of 0.1 mM/liter were 123.9 nM/min/g liver. and 22.8 mM/liter, resp., and in the presence of antipyrine at a concentration of 1.0 mM/liter were 120.0 nM/min/g liver and 15.9 mM/liter, resp. There was no statistically significant change in maximal elimination rate and the half saturation concentration after the addition of antipyrine. The lack of effect of antipyrine on microsomal ethanol oxidation suggests that antipyrine and ethanol may be metabolized by different metabolic pathways in the hepatic microsomes.

2621 EFFECT OF BILE-DUCT LIGATION ON ORGANELLE MARKER ENZYMES IN THE LIVER AND SERUM OF RATS. *(E.)* Peters, T. J.; Neale, G.; Heath, J. R. (R. Postgrad. Med. Sch., London, England). *Clin. Sci. Mol. Med.* 48(4):307-313, 1975.

Sixteen marker enzymes for the principal subcellular organelles of rat liver were assayed in the liver of an inbred strain of male Wistar rats 1 day and 8 days after bile-duct ligation or after laparotomy as a control procedure; alterations in the activities of 8 of these enzymes in serum were also assessed. The microsomal enzymes in liver tissue showed complex changes. Benz[α]pyrene hydroxylase activity, predominantly found in the smooth endoplasmic reticulum, was decreased. Glucose 6-phosphatase activity and ribonucleic acid, which are localized predominantly in the rough endoplasmic reticulum, were increased. The plasma membrane enzyme alkaline phosphatase, increased in activity after bile-duct ligation. No changes in mitochondrial enzyme activities were noted after 1 day but there was a 50% reduction 8 days after ligation. Lysosomal enzyme activities did not change. Liver catalase and D-amino acid oxidase activities showed a slight increase at 1 day postligation but a significant fall by 8 days. Lactate dehydrogenase, a cytosol enzyme, showed a decrease in activity after 1 day but an increase in tissue activities 8 days after ligation. Serum activities of mitochondrial, plasma membrane, microsomal, lysosomal, and cytosol marker enzymes tended to increase postligation, particularly at 8 days. Monamine oxidase, a predominantly mitochondrial enzyme, was greatly elevated in the serum after 1 day but returned to normal levels in 8 days. These studies indicate that all the subcellular organelles of liver tissue are affected by bile duct obstruction. The results further indicate that ultrasensitive methods of enzyme analysis provide a useful tool for exploring subcellular changes in experimentally produced liver disease in animals.

2622 α-NAPTHYL-ISOTHIOCYANATE-INDUCED CHOLESTASIS IN THE RAT: STUDIES OF LIVER PLASMA MEMBRANE ENZYMES. *(E.)* Hertzog, P. J.; Bhathal, P. S.; Dorling, P. R.; LePage, R. N. (Dep. Pathol., Univ. Melbourne, Australia). *Pathology* 7(1):13-23, 1975.

A combined biochemical and morphological study was undertaken of acute α-naphthyl-isothiocyanate-induced cholestasis in female Sprague-Dawley rats. The rats were given a single p.o. dose (100 mg/kg body weight) of α-naphthyl-isothiocyanate in maize oil. Treated and control rats were killed 1, 2, 3, and 7 days after dosing, blood was collected, and liver removed immediately. Small pieces of liver were excised for morphological studies and the rest used for plasma membrane isolation. Conjugated and unconjugated serum bilirubin levels rose to a peak 2 days after treatment and returned to normal by 7 days. The conjugated fraction ranged from 60 to 80% of the total bilirubin levels at the times of maximum jaundice. The activities of 3 liver plasma membrane enzymes, Mg^{++}-ATPase, $(Na^{+}$-$K^{+})$-ATPase and 5'-nucleotidase, were significantly decreased at 2 days after treatment and returned to normal by day 7, thus varying inversely with the degree of hyperbilirubinemia. Enzyme histochemistry, used to demonstrate canalicular localization of Mg^{++}-ATPase in sections of whole liver and of isolated plasma membrane pellets showed that the reduction in activity was not a uniform partial loss, but represented a range of reductions in most canaliculi, a few remaining with normal staining intensity. Electron microscopic examination of liver sections in the first 3 days posttreatment showed dilatation of biliary canaliculi with almost complete loss of microvilli from most caniliculi and swelling of some of the remaining microvilli. Vesiculation of the endoplasmic reticulum with dissociation of ribosomes was also observed. It is suggested that after α-naphthyl-isothiocyanate intoxication there is a membrane lesion which may be responsible for the observed hyperbilirubinemia due to the failure of secretion of biliary constituents into the canaliculus. More direct studies are necessary, however, to determine whether any one of the enzymes is directly involved in the transport of biliary constituents across the bile canalicular membrane.

2623 ETHANOL METABOLISM IN THE VITAMIN C DEFICIENT GUINEA-PIG. *(E.)* Dow, J.; Goldberg, A. (Stobhill Gen. Hosp., Glasgow, Scotland). *Biochem. Pharmacol.* 24(8):863-866, 1975.

The effects of vitamin C deficiency and chronic ethanol treatment on the hepatic redox state and alcohol dehydrogenase activity was investigated in male albino guinea pigs. The guinea pigs were fed a vitamin C-deficient diet for 14 days. The ethanol pretreated groups were intubated daily with 2.5 g ethanol/kg body weight as a 50% solution. Redox state changes were investigated in guinea pigs that had been fasted overnight (18 hr) on the 14th day, injected i.p. with 1.5 g ethanol/kg body weight as 30% solution, killed 30 min later, and their livers rapidly removed. The rate of elimination of ethanol from the blood was determined in a separate but similarly treated group of animals in which 20 μl blood samples were removed from the ear vein at 1/2 hr intervals for 3 hr and blood ethanol measured by an internal standard gas-liquid chromatography method. Guinea pig liver microsomes were prepared from animals who received the standard treatment for 14 days but received no ethanol for 24 hr prior to sacrifice. Aniline hydroxylase, cytochrome P-450, cytochrome b_5, microsomal ethanol oxidizing system activity, NADPH oxidase activity, catalase activity, alcohol dehydrogenase activity and ascorbic acid levels were measured in the microsomal preparations. There was a small but significant decrease in the redox state shift with ethanol in both the ethanol pretreated normal and scorbutic animals compared with the untreated controls. No difference in terminal body weight, liver weight, liver/body weight or alcohol dehydrogenase activity was found between any of the groups of animals studied. The liver ascorbic acid content was decreased to 30% of normal values in both the vitamin C-deficient and chronic ethanol treated vitamin C-deficient groups. Microsomal aniline hydroxylase and NADPH oxidase activities were reduced in the vitamin C-deficient groups and the amount of cytochrome P-450 was decreased but there was no change in the *in vivo* rate of ethanol elimination or in the concentration of cytochrome b_5. Chronic ethanol treatment did not induce microsomal enzyme activities or increase the concentration of microsomal electron transport components. No evidence was found for a role *in vivo* for the microsomal ethanol oxidizing system in ethanol metabolism, as a reduction in microsomal enzyme activities and electron transport components had no effect on ethanol elimination *in vivo*. When alcohol dehydrogenase activity is normal, no further systems appear to be required for ethanol metabolism.

2624 REGULATION OF HEPATIC REGENERATION IN RATS BY SYNERGISTIC ACTION OF INSULIN AND GLUCAGON.

(E.) Bucher, N. L. R.; Swaffield, M. N. (Massachusetts Gen. Hosp., Boston). *Proc. Natl. Acad. Sci. USA* 72(3):1157-1160, 1975.

The function of the pancreatic hormones in hepatic regeneration was examined in eviscerated male Sprague-Dawley rats. The rats were subjected to resection of the gastrointestinal tract, pancreas, and spleen, and maintained by continuous i.v. infusion. Such animals, receiving only electrolytes and glucose, responded to 68% hepatectomy with a significant rise in hepatic DNA synthesis, which was, however, greatly delayed and diminished compared with normal controls. The activity was restored to normal by infusion of insulin and glucagon (supplemented with glucose and amino acids) but not by either hormone alone; it was not decreased by delaying the start of hormone treatment for 6-7 hr after partial hepatectomy. Infusion of insulin and glucagon into rats with intact livers did not appreciably elevate DNA synthesis. In normal rats partial hepatectomy was followed by an abrupt fall in portal vein insulin concentration. These findings suggest that agents other than insulin and glucagon may serve to initiate hepatic regeneration, but that these 2 hormones acting synergistically are major regulators of the rate and perhaps also the extent of the regenerative process.

2625 EFFECT OF LONG-TERM ADMINISTRATION OF DIFFERENT ALCOHOLIC BEVERAGES TO RATS ON LIVER LIPID METABOLISM AND BILE ACID CONJUGATION.

(E.) Jordo, L.; Olsson, R.; Schersten, T. (Dep. Med., Univ. Goteborg, Sweden). *Digestion* 11(3/4):183-193, 1974.

The effect of various alcoholic beverages (ethanol, brandy, whisky, gin and red wine of cheap qualities) on hepatic triglyceride, phospholipid, and cholesterol concentration, incorporation rate of glycerol into hepatic triglycerides and phospholipids, and bile acid conjugation rate was studied in male Sprague-Dawley rats fed alcohol as 50% of the caloric intake for 8-9 months. Two groups of rats served as controls: one fed glucose instead of alcohol and another fed a standard laboratory diet. A special series of rats fed the same amount of ethanol for 10 days was also investigated. The mean daily food consumption, which was initially about 380 kcal/kg, decreased with the growth of the animals to about 160 kcal/kg toward the end of the experiments. Thus the mean daily alcohol consumption over the whole period was about 20 g/day. Serum ethanol concentrations, measured in 15 animals at different times of the day during the last 2 months, ranged between 55-270 mg/100 ml. In the long-term study no unambiguous changes of hepatic lipid concentration, incorporation rate of glycerol into hepatic lipids, and bile acid conjugation rate were found in the glucose-fed animals. In the 10-day study the ethanol-fed rats showed a 60% increase of hepatic triglyceride concentration and of the incorporation rate of glycerol into hepatic triglycerides as well as 30% increase of the rate of bile acid conjugation compared with glucose-fed controls. The various alcoholic beverages showed almost no differences in their effects on lipid metabolism or bile acid conjugation rate. The results suggest that other pathways for ethanol metabolism than the NADH_2-producing alcohol dehydrogenase system become of increased importance with prolonged ethanol administration. In agreement with other studies of similar duration, in which fat constituted less than 20% of the total calories, a persistant steatosis was not found after 8-9 months of ethanol feeding. It is suggested therefore, that ethanol *per se* does not cause persistant fatty liver but that a concomitant high fat intake might be one key factor for a progressive and/or persistent steatosis.

2626 PORTACAVAL SHUNT IN THE RAT: TECHNIQUE AND RESULTS.

(Ger.) Zelde, O.; Schmitt, C. G. (Surg. Clin., Univ. Marburg/Lahn, Germany). *Z. Gastroenterol.* 12(3):193-200, 1974.

A comparison was made of portacaval shunts with end-to-side and side-to-side anastomoses in male SIV 50 rats. Controls consisted of rats which underwent sham surgery, i.e. the hepatic artery was mobilized from the portal vein. Rats were sacrificed either 21 days or 6 months after surgery, and the condition of the anastomosis was studied by splenoportography. The postoperative mortality was 0% for functional end-to-side and side-to-side anastomoses. By 3 months after surgery, 60% of the rats with end-to-side anastomoses had died and by 6 months, 87%. The corresponding mortality rates for rats with side-to-side anastomoses were 33% and 40%, resp. This suggests that not all blood from the portal vein bypasses the liver in side-to-side anastomoses. Body weights were significantly decreased 6 months after end-to-side anastomoses, but not after side-to-side anastomoses or sham surgery. In rats with end-to-side anastomoses, the weight of the liver decreased to a greater extent during the first 21 days after surgery than in the other groups of animals; no appreciable change in the weight of the liver occurred thereafter. Histological examination of the liver of rats that died revealed moderate steatosis, cell atrophy, occasional pyknosis and vacuolization of the nuclei and, in some cases, small areas of necrosis. No small scars were found in the hepatic parenchyma which would indicate prior necrosis. On the basis of these findings, portacaval shunts with side-to-side anastomoses are recommended for use as an animal model in patho-physiological investigations since the animals can be followed for a relatively long time after surgery.

2627 THE ROLE OF SEX DIFFERENCES IN THE EFFECT OF ANABOLICS ON THE LIVER. *(E.)* Kulcsar-Gergely, J.; Kulcsar, A.; Kiss, A. (Univ. Med. Sch., Debrecen, Hungary). *Arzneim. Forsch.* 25(3):417-420, 1975.

Two anabolic steroids, nandrolone phenpropionate and nandrolone decanoate, were studied in Wistar rats to determine whether they had any influence on the course of a given liver function and caused any enzyme induction; whether there were any sex differences when exerting their influence; and, when administered simultaneously with carbon tetrachloride (1.0 ml/kg 3 times a week), how they influenced the severity of the induced liver lesion. Both steroids were administered i.m. in oil injection, a single dose being 25 mg/kg. In continuous treatment the animals were injected 3 times a week. Body weight, wet liver weight, and the protein content of liver homogenates increased under the effect of anabolic treatment. The largest increases were seen in females treated with nandrolone phenpropionate. Hepatic hexobarbital metabolism, measured *in vivo*, was increased by a single dose of anabolic. The prolongation of treatment kept shortening hexobarbital anesthesia in females only. Even 8 weeks after the end of treatment the effect was invariably seen in females but not in males. There was no decline in ovarian function. The hepatotropic effect of anabolic treatment, given simultaneously with carbon tetrachloride, was demonstrated in females. Under the effect of anabolic treatment, hepatic hexobarbital metabolism, which had been impaired by the experimental lesion, remained near the levels of the untreated animals. Previous observations that the ability of steroids to cause enzymatic induction is related to their anabolic character are supported by these findings. Induction was stronger and more long-lasting in females than in males. According to comparative analyses of the effect on the liver, nandrolone phenpropionate is more effective, as the same dose had double the effect of nandrolone decanoate. It is concluded that the effect of anabolics on enzymatic induction may be of therapeutic value when carefully chosen preparations are applied in adequately selected cases and sex differences as well as the kind of liver damage are taken into account.

2628 THE SUBCELLULAR LOCALIZATION OF ALDEHYDE DEHYDROGENASE IN RAT LIVER. *(E.)* Horton, A. A.; Barrett, M. C. (Dep. Biochem., Univ Birmingham, England). *Arch. Biochem. Biophys.* 167(2):426-436, 1975.

Evidence supporting the existence of 3 aldehyde dehydrogenases, betaine aldehyde dehydrogenase and 2 aldehyde dehydrogenases ALDH-I and ALDH-II, in female Wistar rats was confirmed and the localization of these enzymes within the liver cell investigated by extensive subcellular fractionation studies. The subcellular fractionation and subsequent spectrophotometry indicated that betaine aldehyde dehydrogenase is predominantly in the cytosol with about 5% in the mitochondria. Of the aldehyde dehydrogenase activity (ALDH-I plus ALDH-II), 80% was found in the mitochondria and 20% in the microsomal fraction. Of the 2 enzymes, ALDH-I was exclusively mitochondrial and ALDH-II was distributed between mitochondria and microsomes. Submitochondrial fractionation indicated that betaine aldehyde dehydrogenase and ALDH-I are located in the matrix and ALDH-II is located chiefly in the outer membrane. These studies confirm the existence of 3 aldehyde dehydrogenases in the rat liver cell.

2629 EXPERIMENTAL STUDIES ON LIPID AND CARBOHYDRATE METABOLISM IN HUMAN LIVER BIOPSIES. *(Ger.)* Oette, K. (Med. Clin., Univ. Cologne, Germany). *Klin. Wochenschr.* 52(20):956-965, 1974.

Research on the effect of dietary fat and carbohydrate on lipid and carbohydrate metabolism in the human liver is reviewed. Studies were performed on human liver biopsies obtained with a Menghini needle and weighing 5-40 mg. When linolenic acid (40-100 g) was added to the diet as a metabolic indicator for long-chain fatty acids, no more than 12% was recovered from the liver, the amount depending upon the linolenic acid content of the diet. In two patients with minor atypical parenchymal changes but no steatosis, more linolenic acid was present in the phosphatide than in the glyceride fraction 5-6 hr after administration. Addition of 1-^{14}C-linolenic acid to the diet had no effect on the enzymes involved in fatty acid uptake and esterification in the liver, and the ratio of dietary carbohydrate to fat had no effect on total uptake nor on incorporation of fatty acids into the various lipid fractions. Diets with lower fat or higher carbohydrate contents reduced incorporation of 1-^{14}C-acetate into total lipids in the human liver. This anomalous finding is attributed either to intracellular dilution of 1-^{14}C-acetate by increased synthesis of inactive acetyl-coenzyme A from glucose or to a deficiency of coenzyme A (competitive inhibition). When a high-fat diet was administered, 1-^{14}C-acetate was used almost exclusively for chain lengthening, and the C_{20}-C_{22} polyunsaturated fatty acids formed were preferentially incorporated into the phosphatide fraction. Studies on the metabolism of U-^{14}C-hexoses and U-^{14}C-glycerol in the human liver revealed that, under the experimental and dietary conditions employed, glucose, fructose, and galactose were incorporated into the glycogen and glyceride fractions in the liver and only small amounts were used for *de novo* fatty acid synthesis. When the diet contained about 30-45% fat, calculated on a caloric basis, the rate of *de novo* phosphatide synthesis in the human liver was more than twice the rate of fatty acid synthesis when fructose was used as the carbohydrate. Fructose and galactose were used for glycogen synthesis to about the same extent, while glucose was used in far larger quantities. In the *in vitro* system employed, degradation products of fatty acids, particularly stearic acid, and fructose, rather than glucose, were the preferred precursors of cholesterol. A high-fat diet did not increase the rate of cholesterol synthesis. However, administration of ethanol for several days increased the rate of cholesterol, but not that of cholesterol ester, synthesis. If the results of these experiments can be extrapolated to *in vivo* conditions and plasma lecithin-cholesterol acyltransferase activities are taken into account, these findings confirm that the human liver is of minor importance for the synthesis of cholesterol esters.

2630 SYNTHESIS OF THE SULFATE ESTERS OF BILE ACIDS IN THE PERFUSED RAT LIVER AFTER BILE DUCT OCCLUSION. *(Ger.)* Liersch, M.; Stiehl, A. (Med. Clin., Univ. Heidelberg, Germany). *Z. Gastroenterol.* 12(2):131-134, 1974.

Synthesis of the sulfate esters of bile acids was studied in isolated perfused livers from male Sprague-Dawley rats. Cholestasis was induced 1-3 weeks before perfusion or immediately before perfusion with a hemoglobin-free medium (100 ml Krebs-Henseleit solution, 2.5 g bovine serum albumin, and 5.5 mM glucose) to which lithocholic acid (0.12 mM) or other ^{14}C-labeled bile acids (0.25×10^{-3} M) had been added. While livers from intact rats rapidly extracted bile acids from the perfusion medium, cholestatic livers removed only about 6 µM in 150 min of perfusion. After 150 min of perfusion, about 35% of lithocholic acid, but only 1-2% of cholic and chenodeoxycholic acids, had been converted to their sulfate esters. The duration of cholestasis had no effect on synthesis of the sulfate ester of lithocholic acid, but synthesis of the sulfate ester of taurocholic acid increased with the duration of cholestasis. Sulfate esters of taurocholic acid accounted for 2.6% of this when the bile ducts were occluded immediately before perfusion, but for 6% and 8% after 1 and 2 weeks of cholestasis, resp. Thin-layer chromatographic analysis of the medium after perfusion with free bile acids revealed that more than 95% of the bile acids were present in conjugated form after 150 min. Studies with cell-free extracts are being performed to determine whether free bile acids have to undergo conjugation with taurine before they can be converted to their sulfate esters.

2631 EXPERIMENTAL ALCOHOL-INDUCED HEPATIC NECROSIS: SUPPRESSION BY PROPYLTHIOURACIL. *(E.)* Israel, Y.; Kalant, H.; Orrego, H.; Khanna, J. M.: Videla, L.; Phillips, J. M. (Dep. Pharmacol., Univ.. Toronto, Canada). *Proc. Natl. Acad. Sci. USA* 72(3): 1137-1141, 1975.

The hypothesis that the hypermetabolic state that exists in the livers of animals treated chronically with ethanol produces a relative hypoxia in the centrilobular zone of the liver which, if severe enough, leads to cellular death and the production of hepatitis was tested in male Wistar rats. Rats consuming ethanol (35% of the total calories) for 30 days, given with a nutritionally adequate diet, and exposed to reduced oxygen tensions (11, 7.5, or 5%, the remainder being pure nitrogen) for 6 hr, developed histological and biochemical evidence of hepatocellular necrosis and inflammatory lesions confined to the centrilobular zone. The severity was proportional to the degree of hypoxia. Pair-fed (nonalcohol) controls showed no such lesions. Treatment of the animals with 6-propyl-2-thiouracil (5 mg/100 g daily) abolished the hypermetabolic state of the liver in ethanol-consuming animals, and reduced the histological and biochemical effects of hypoxia. Since 6-propyl-2-thiouracil reduced both the hypermetabolic state of the liver and susceptibility of the liver to damage by hypoxia in animals treated chronically with ethanol, it is concluded that the hypermetabolic state may be responsible for the supersensitivity to hypoxia. If a hypermetabolic state also occurs in the liver of the alcoholic patient, it is conceivable that a reduction in the availability of oxygen to the liver could explain the production of alcoholic hepatitis and that 6-propyl-2-thiouracil could also be therapeutically effective in the treatment of alcholic hepatitis in man.

2632 THE DISTRIBUTION OF BILE ACIDS IN HEPATOCYTES IN EXTRAHEPATIC CHOLESTASIS. II. *(Ger.)* Leuschner, U.; Kurtz, W.; Alfurayh, A.; Erb, W.; (Cent. Intern. Med., Johann Wolfgang Goethe Univ., Frankfurt/Main, Germany). *Z. Gastroenterol.* 12(3):163-168, 1974.

Extrahepatic cholestasis was induced in 17 male Wistar rats by double ligation of the bile duct, severing it just before the opening into the small intestine. After 17 days the rats were sacrificed and their livers were removed along with the dilated extrahepatic bile ducts. The larger intrahepatic bile ducts were emptied by gentle compression, bile was cleaned off from the surface of the liver, and the hepatic vein was perfused several times with a solution containing 0.3 M KCl and 0.05 of potassium EDTA. Liver homogenate was then fractioned in the above solution by differential centrifugation, and the fractions were analyzed for bile acids by gas chromatography. The mean bile acid content of a liver weighing 13.5 g was 157.6 µg. Of this bile acid, 8.3% was found in the mitochondria, 23.4% in the microsomes, and 68.3% in the supernatent or cytoplasmic fraction. In all three fractions the bile acid present in the highest concentration was cholic acid. While the highest concentrations of cholic acid were found in the microsomes and supernatant, the highest concentrations of β-muricholic and lithocholic acids were detected in the mitochondria and microsomes. Chenodeoxycholic acid was distributed uniformly throughout all fractions. In all fractions, total dihydroxy (deoxycholic and chenodeoxycholic) acids were present in concentrations less than 1/10 of the concentrations of trihydroxy (cholic and β-muricholic) acids. A comparison of these findings with the distribution of bile acids in the liver of normal rats showed that the total bile acid content was 69% lower in extrahepatic cholestasis. Bile acids were 34% lower in the mitochondria, 88.4% lower in the microsomes, but 102% higher in the supernatant. It is suggested that an increase in the concentration of trihydroxy bile acids results in impairment of synthesis in the hepatocytes in extrahepatic cholestasis.

2633 INFLUENCING THE MICROSOMAL ENZYME ACTIVITY IN THE RAT LIVER BY ETHANOL WITH AND WITHOUT DRUGS.

(Ger.) Bode, C.; Bode, J. C.; Martini, G. A. (Med. Clin., Univ. Marburg, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:909-910, 1973.

Groups of 8-10 male Wistar rats were given a standard diet containing 20% protein *ad libitum* and: 1) water; 2) 15% (w/v) ethanol solution *ad libitum*; 3) 15% ethanol solution *ad libitum* and 5 g/kg/day ethanol p.o. through a tube; 4) water and 100 mg/kg/day phenobarbital; and 5) water, 100 mg/kg/day phenobarbital, 15% ethanol *ad libitum*, and 5 g/kg/day ethanol p.o. through a tube. Two other groups of rats received a low protein diet (5% protein) with: 6) water; or 7) 15% ethanol solution *ad libitum* and 5 g/kg/day ethanol p.o. The activities of acetanilide hydroxylase (AAH) and NADPH- and NADH-dependent cytochrome c reductase (CcR) were reduced to about 50% of control values in groups 2 and 3, while activities of steroid reductase (SR) and glucose-6-phosphatase (G-6-P) were reduced by 150-200%. No significant differences in enzyme activities were found between group 2 and 3. In group 4, phenobarbital had no effect on the activities of AAH or NADH-dependent CcR, but it did increase the activities of NADPH-dependent CcR, SR, and G-6-P. In group 5, administration of both alcohol and phenobarbital increased only the activity of G-6-P; no changes occurred in the activities of the other enzymes studied. In group 6 a low-protein diet reduced the activities of AAH and NADH- and NADPH-dependent CcR to about 20-30% of control values. Combination of a low-protein diet with ethanol (group 7) had no further effect on microsomal enzyme activity. G-6-P activity was twice that of control values in groups 6 and 7, while SR activity was significantly reduced in groups 6 and 7. These findings demonstrate that ethanol has different effects on microsomal enzyme activity. The fact that chronic alcoholics sometimes eat protein-deficient diets and ingest sedatives or other drugs may account for reported discrepancies in drug metabolism in alcoholism.

2634 HORMONAL INFLUENCES IN THE DEVELOPMENT OF THE HYPERMETABOLIC STATE OF THE LIVER PRODUCED BY CHRONIC ADMINISTRATION OF ETHANOL.

(E.) Bernstein, J.; Videla, L.; Israel, Y. (Dep. Pharmacol., Univ. Toronto, Canada). *J. Pharmacol. Exp. Ther.* 192(3):583-591, 1975.

The relative participation of adrenaline and of thyroid hormones in the production of a liver hypermetabolic state induced by chronic ethanol administration was investigated in male Wistar rats. The animals were given ethanol by gastric intubation for 15-19 days in increasing doses: 3 g/kg for 3 days (as 20 w/v solution); 4 g/kg for 3 days (25% solution); 5 g/kg for 3 days (30% solution); and 6 g/kg (35% solution) for the remaining period. Thyroidectomized, adrenalectomized, and control animals in the ethanol-treated groups weighed 10-20 g less than dextrose-treated groups at the end of the treatment. In another experiment, animals were given liquid diets in which ethanol provided 35% of the total calories. Chronic administration of ethanol to the rats led to the development of a hypermetabolic state of the liver. The calorigenic effects produced by ethanol, measured in liver slices, could by reproduced by a single large dose of epinephrine (2 mg/kg s.c.). Oxygen consumption by liver slices of animals given this large dose of epinephrine bitartrate increased 40-50%. In these livers all the extra oxygen consumption, but not the basal respiration, could be abolished by ouabain, an inhibitor of the sodium pump. 2,4-Dinitrophenol did not affect the respiratory rate in the liver of epinephrine-treated animals but markedly increased that in controls. In the livers of treated animals, the activating effect of 2,4-dinitrophenol was recovered in the presence of ouabain. The calorigenic effect of epinephrine in the liver was completely abolished by phentolamine (α-adrenergic blocker) but was not modified by DL-propranolol (β-adrenergic blocker). The calorigenic effects produced by epinephrine were not seen in thyroidectomized animals or by incubating the liver slices in a calcium-free medium. It is concluded that thyroidectomy and administration of phentolamine markedly reduced, and adrenalectomy completely abolished, the hypermetabolic state produced in the liver of rats by chronic administration of ethanol.

2635 STEROID PROTECTION OF THE LIVER DURING EXPERIMENTAL ISCHEMIA.

(E.) Figueroa, I.; Santiago-Delpin, E. A. (Univ. Puerto Rico Med. Sch., San Juan). *Surg. Gynecol. Obstet.* 140(3):368-370, 1975.

The effect of steroids during transitory experimental warm hepatic ischemia was investigated in rabbits in which total hepatic ischemia was produced by ligating the portal triad and gastrohepatic ligament for 30 min. A survival rate of 10% was obtained in controls. If methylprednisolone was given (30 mg/kg i.v.) 5-10 min prior to occlusion, 100% of the rabbits survived. If methylprednisolone was given (30 mg/kg i.v.) immediately after occlusion, the survival rate was 54%. Further experiments extending occlusion to 1 hr resulted in a 50% survival rate with prior methylprednisolone administration as compared with no survivors among controls. Two hypotheses on the mechanism of methylprednisolone protection of the liver during ischemia are presented: 1) methylprednisolone prolongs the tolerance to actual ischemia by protecting the cell membrane or by stabilizing the lysozomal membrane of the ischemic hepatic cell; or 2) it inhibits or blocks the effect on the cardiovascular system of already circulating toxic substances liberated from the liver during the ischemic period. The fact that treatment before occlusion resulted in a more prolonged survival time than treatment after occlusion suggests that the first hypothesis is probably the most important one, even though the second must be operational as well.

2636 EFFECTS OF CHRONIC ETHANOL TREATMENT AND THYROXINE ADMINISTRATION ON ETHANOL METABOLISM AND LIVER OXIDATIVE CAPACITY. *(E.)* Israel, Y.; Videla, L.; Fernandex-Videla, V.; Bernstein, J. (Dep. Pharmacol., Univ. Toronto, Canada). *J. Pharmacol. Exp. Ther.* 192(3):565-574, 1975.

The rate of ethanol metabolism *in vivo* and by liver slices *in vitro* in male Wistar rats treated with thyroxine, was investigated in an effort to determine the cause for previously published contradictory reports on the effect of thyroid hormones on the rate of ethanol metabolism. The rats were given nutritionally complete liquid diets providing 35% of the total calories as ethanol for 21-27 days. The average daily alcohol intake of animals was 14.3 g/kg/day. This chronic administration of ethanol led to an increased rate of ethanol metabolism *in vivo* and *in vitro*. *In vitro* studies in liver slices showed that ouabain, an inhibitor of the $Na^+ + K^+$-activated ATPase, completely blocked the extra ethanol metabolism elicited by chronic ethanol treatment. 2,4-Dinitrophenol increased the rate of ethanol metabolism in the livers of the treated animals only in the presence of ouabain. Administration of thyroxine led to an increase in the rate of ethanol metabolism when measured both *in vitro* and *in vivo*. This effect was biphasic; an activation occurred only with low doses of thyroxine but disappeared after administration of larger doses. Alcohol dehydrogenase activity in the liver of the animals treated with large doses of thyroxine was reduced significantly. With the doses used (50-1000 g/kg), thyroxine also increased the rate of oxygen consumption as measured in liver slices. However, a biphasic effect did not occur. A near maximum activation on the rate of oxygen consumption occurred with low doses of thyroxine (100 μg/kg). Oxygen consumption was also increased in the livers of animals chronically treated with ethanol. A maximal effect was produced after 18-21 days of treatment. For both ethanol and thyroxine-treated animals, an increased rate of oxygen consumption occurred with a concomitant loss of dinitrophenol effect. Mitochondrial-glycerophosphate oxidase was increased in the liver of animals treated with ethanol or with thyroxine. In these two groups, this enzymatic activity appeared to be less affected by the treatment than the 2,4-dinitrophenol-activated respiration. Although these results show that chronic treatment with ethanol produces many changes in the liver that are similar to those produced by thyroid hormones, it is concluded that it is not possible to ascertain that the chronic effects of ethanol were only mediated by thyroid hormones.

2637 UDP-GLUCURONYLTRANSFERASE IN PERFUSED RAT LIVER AND IN MICROSOMES: INFLUENCE OF PHENOBARBITAL AND 3-METHYLCHOLANTHRHENE. *(E.)* Bock, K. W.; White, N. H. (Toxicol. Inst., Tubingen, Germany). *Eur. J. Biochem.* 46(3):451-459, 1974.

1-Naphthol glucoronide formation and liver uridine diphosphate (UDP)-glucuronate levels were determined in perfused livers from control, phenobarbital treated and 3-methyl cholanthrene-treated rats, and the rates of glucuronidation compared with UDP-glucuronyltransferase activity in native and microsomal preparations activated by Triton X-100 *in vitro*. Male Sprague-Dawley rats received 3 daily i.p. injections of 100 mg/kg/ phenobarbital and were sacrificed on the fourth day. Those rats treated with 3-methylcholanthrene were injected once i.p. with 40 mg/kg in olive oil; hepatectomy was performed on the fourth day. Galactosamine-HCl (400 mg/kg) was injected once i.p. 3 hr before sacrifice. Liver microsomal UDP-glucuronyltransferase (1-naphthol as substrate) was activated about 10-fold by treatment of native microsomes *in vitro* with Triton X-100. Following pretreatment with 3-methylcholanthrene or phenobarbital the specific activities of detergent-activated microsomes were increased about 300% and 40%, resp. In isolated liver perfused with 0.5 mM 1-naphthol, the rate of glucuronidation of naphthol as determined by the appearance of naphthol glucuronide in the perfusate, bile and liver tissue, was 0.1 μM/min/g liver. This rate of glucuronidation was increased by 70% in rats pretreated with 3-methylcholanthrene and 140% following phenobarbital treatment. A UDP-glucuronic acid level of 0.3 μm/g liver was determined in perfused liver from control rats. This level remained unchanged during perfusion with 0.5 mM 1-naphthol. In the perfused liver from phenobarbital or 3-methylcholanthrene treated rats, the UDP-glucuronate level increased to 0.5 μM/g liver. In control, 3-methylcholanthrene or phenobarbital-treated rats, rates of glucuronidation of 1-naphthol in the perfused liver system correspond best with the UDP-glucuronyltransferase activities determined in native microsomes when the different UDP-glucuronate levels, microsomal protein contents and liver weights are taken into account. The results suggest that the enzyme is mostly latent in the microsomal membrane and that this latency is increased after pretreatment of rats with 3-methylcholanthrene despite the marked enzyme induction.

2638 THE CHOLERETIC MECHANISMS OF SODIUM TAUROCHOLATE, SECRETIN, AND GLUCAGON. *(E.)* Russell, T. R.; Searle, G. L.; Jones, R. S. (VA Hosp., San Francisco, Calif.). *Surgery* 77(4):498-504, 1975.

The choleresis stimulated by sodium taurocholate, secretin, and glucagon was compared as was the effect of each of these substances on canalicular secretion as estimated by the biliary clearance of erythritol. Three mongrel dogs were prepared by cholecystectomy, ligation of the lesser pancreatic duct, and insertion of modified Thomas cannulas into the duodenum and stomach. After recovery from surgery, experiments were performed (as often as 3 times weekly but never on successive days) by cannulation of the common bile duct for bile collection through the duodenal cannula. After cannulation, bile and gastric juice were collected continuously at 15 min intervals for the duration of the experiment. Sodium chloride solution (0.9%) was infused i.v. throughout all experiments. Choleretic test substances were added at the end of the eighth 15-min period and the dose of each substance increased hourly for the remainder of the experiment. At the end of the fourth 15-min period, 3 μCi ^{14}C-labeled erythritol was injected i.v. and an i.v. infusion of [^{14}C]erythritol begun and continued at a rate of 3 μCi/hr for the remainder of the experiment. All test substances caused increased bile secretion. Sodium taurocholate caused a marked increase in bile salt output and in the biliary clearance of erythritol. Secretin caused a large increase in bile flow, no increase in bile salt output, and a very small increase in the biliary clearance of erythritol. The results indicate marked differences in the choleretic mechanism of sodium taurocholate and secretin and suggest that the principal action of taurocholate is on the canaliculi and the principal action of secretin is on the ducts.

2639 TIME COURSE OF PROTECTION BY N,N'-DIPHENYL-p-PHENYLENDIAMINE (DPPD) AGAINST CARBON TETRACHLORIDE HEPATOTOXICITY.

(E.) Torrielli, M. V.; Ugazio, G.; Gabriel, L.; Burdino, E. (Inst. Gen. Pathol., Univ. Turin, Italy). *Agents Actions* 4(5):383-390, 1974.

The mechanism of protection by *N*,*N*'-diphenyl-*p*-phenylenediamine (DPPD) against carbon tetrachloride intoxication was investigated in male Wistar rats. DPPD was suspended in 2.5% acacia gum and given i.p. 60 mg/100 g 48 and 24 hr before intoxication. CCl_4, either 25 or 250 μl/100g, was given p.o. in mineral oil. The preliminary treatment with DPPD prevented liver fatty infiltration after CCl_4 poisoning. Double bond shifting in microsomal lipids was depressed 30 min after intoxication. A more active protection took place with low doses of CCl_4 than after a large dose. In later stages of CCl_4 challenge, both triglyceride accumulation and lipid peroxidation took place in spite of DPPD treatment. However, they were less severe and more transient than in unprotected animals. Liver necrosis, as evidenced by changes in serum activity of alanine aminotransferase, was prevented by DPPD. When animals treated with either DPPD or its suspending medium were given ^{14}C-labeled CCl_4, and the exhaled $^{14}CO_2$ assayed by liquid scintillation spectrometry and the lipid-bound radiocarbon was assayed, it was found that DPPD did not interfere with the hepatic metabolism of CCl_4. Pretreatment with DPPD partially inhibited the *in vitro* demethylation of aminopyrine by liver microsomes and significantly potentiated the hypnotic effect of hexobarbital (12 mg i.p.). When injected along with phenobarbital (8 mg/100 g/day i.p. for 3 days), DPPD blocked the barbiturate stimulation of microsomal enzymes. A combined dosing with DPPD and CCl_4 caused a more severe inhibition of demethylase activity and hexobarbital metabolism. It is concluded that *N*,*N*'-diphenyl-*p*-phenylenediamine interferes with the metabolism of CCl_4 only up to the threshold level covering the development of the most common secondary phenomena induced by this haloalkane, but that the non-inhibited cleavage of carbon tetrachloride allows the primary attack to take place and to progress up to a certain extent.

2640 ETHANOL METABOLISM AND LIVER OXIDATIVE CAPACITY IN COLD ACCLIMATION.

(E.) Videla, L.; Flattery, K. V.; Sellers, E. A.; Israel, Y. (Dep. Pharmacol., Univ. Toronto, Canada). *J. Pharmacol. Exp. Ther.* 192(3):575-582, 1975.

The role of the $Na^+ + K^+$-activated ATPase system in changes leading to an increased oxidative capacity and an increased ethanol metabolism in the livers of male Wistar rats exposed to 5 C for 4 - 6 weeks was investigated. The animals were supplied with food and water *ad libitum*. The cold exposure led to 30-80% increases in the rate of oxygen consumption and a 50% increase in the rate of ethanol oxidation by liver slices, a 50% increase in mitochondrial α-glycerophosphate oxidase activity of liver, and a 100% increase in $Na^+ + K^+$ -activated ATPase activity. Ouabain (1mM), an inhibitor of the $Na^+ + K^+$ -activated ATPase, completely blocked the extra respiration and ethanol oxidation. 2,4-Dinitrophenol, which increases oxygen consumption and ethanol oxidation by liver slices from normal rats, was ineffective with slices from cold-exposed animals. The ethanol disappearance rate *in vivo* was also increased by cold acclimation, even though liver alcohol dehydrogenase activity was reduced. It is suggested that increased hydrolysis of ATP by the sodium pump system is responsiblle for the increased oxygen consumption and ethanol metabolism in the livers of cold-acclimated animals.

2641 SEQUENTIAL PRODUCTION OF FATTY LIVER, HEPATITIS, AND CIRRHOSIS IN SUB-HUMAN PRIMATES FED ETHANOL WITH ADEQUATE DIETS.

(E.) Lieber, C. S.; DeCarli, L. M.; Rubin, E. (VA Hosp., Bronx, N.Y.). *Proc. Natl. Acad. Sci. USA* 72(2):437-441, 1975.

An experimental model has been developed that reproduces the sequential development of all the liver lesions seen in the human alcoholic. Nine pairs of baboons were pair-fed an alcohol-containing or control liquid diet for 8-22 months, with the average length of treatment being 15 months. An additional group of 12 animals that had been given a solid diet with either alcohol or carbohydrates in the drinking water for a period varying from 17-34 months were changed to the liquid diet for an average of 17 months. The protein content of the diet (18% of total calories) corresponded to that of commonly used commercial diets that are satisfactory for the baboon. The incorporation of the ethanol (50% of total calories) in a totally liquid diet permitted the maintenance of a nutritionally adequate regimen despite the intake of inebriating amounts of ethanol. In the 15 baboons fed ethanol, all developed fatty liver, five progressed to hepatitis, and five had cirrhosis. Upon ethanol withdrawal, signs of physical dependence, such as seizures and tremors, developed. Surgical biopsies of the liver were performed at regular intervals under anesthesia. Ultrastructural changes of the mitochondria and the endoplasmic reticulum were already present at the fatty liver stage and persisted throughout hepatitis and cirrhosis. The lesions were similar to those observed in alcoholics (including the inflammation and the central sclerosis) and differed from the alterations produced by choline and protein deficiencies. At the fatty liver stage, some adaptive increases in activity of microsomal enzymes (aniline hydroxylase and the microsomal ethanol oxidizing system) were observed, but these tended to disappear with the development of hepatitis and cirrhosis. Fat accumulation was also much more pronounced in the animals with hepatitis as compared with those with simple fatty liver (an 18-fold compared with 3- to 4-fold increase in liver triglycerides). The demonstration that these lesions can develop despite an adequate diet indicates that in addition to correction of the nutritional status, control of alcohol intake is mandatory for the management of patients with alcoholic liver injury.

2642 THE INTERACTION OF VASOACTIVE INTESTINAL POLYPEPTIDE AND SECRETIN WITH LIVER-CELL MEMBRANES. *(E.)* Desbuquois, B. (INSERM, Hosp. Sick Child., Paris, France). *Eur. J. Biochem.* 46(3):439-450, 1974.

The interaction of vasoactive intestinal polypeptide (VIP) and secretin with isolated rat liver-cell membranes was investigated using ^{125}I-labeled derivatives of the hormones. Incorporation of iodine did not appreciably affect the ability of VIP to stimulate the activity of adenylate cyclase in liver membranes, but caused a 2-3 fold decrease in the apparent affinity of secretin towards this enzyme. Native VIP and secretin readily displaced [^{125}I]VIP specifically bound to liver cell membranes; about 100 times greater concentrations of secretin were necessary to achieve effects similar to those observed with VIP. Synthetic secretin displaced the VIP-membrane complex identically to natural secretin. The labeled material dissociated from the VIP-membrane complex retained the ability of unused VIP to bind to membranes but VIP in the incubation medium was rapidly inactivated upon exposure to membranes and to certain polypeptides, such as bacitracin. At 23 C, the rate of VIP-membrane association was 1.3 x 10^{7}/M/sec and the rate of dissociation, 2.3 x 10^{-3}/sec. The dissociation constant based on these rate constants is 0.17 nM; the value of 0.16 nM was obtained separately from equilibrium data. Binding of VIP to membranes was reduced by increasing the ionic strength of the medium. Maximum binding occurred at pH 7.4. Nucleoside di- and triphosphates decreased the binding of VIP to membranes at equilibrium and increased the rate of dissociation of the VIP-membrane complex. Digestion of the membranes with trypsin and phospholipase A resulted in a loss of the ability of these membranes to bind VIP. [^{125}I]secretin bound specifically to liver membranes. Binding was competitively inhibited by native secretin and VIP in a closely similar fashion to that of [^{125}I]VIP. Only a small fraction (2-3%) of the medium secretin bound to membranes. At equivalent concentrations, the iodinated derivative of natural secretin bound to membranes more effectively than that of the synthetic peptide. After incubation of natural [^{125}I]-secretin with liver membranes, the radioactive material eluted from the membranes with urea was about 3 times more potent than unused secretin in its ability to bind to fresh membranes. These findings suggest that a fraction of the iodinated derivative of natural secretin which binds to membranes is probably iodinated VIP present as a contaminant. It is further suggested that the vasoactive intestinal polypeptide binding structures identified in liver cell membranes represent biological receptors for this hormone.

2643 MULTICOMPARTMENTAL ANALYSES OF TWO- AND THREE-EXPONENTIAL PLASMA DISAPPEARANCE CURVES AFTER INTRAVENOUS INJECTION OF ^{14}C-CHOLIC ACID, SULFOBROMOPHTHALEIN, AND ^{14}C-BILIRUBIN: THEIR VALUE IN QUANTITATIVE STUDIES OF HEPATIC EXCRETION. *(Ger.)* Klapdor, R.; Eppers, J. (1st Med. Clin., Univ. Hamburg, Germany). *Z. Gastroenterol.* 12(1): 1-8, 1974.

In a study of eight miniature pigs, anesthetized with pentobarbital sodium, it was demonstrated that the distribution and excretion of ^{14}C-cholic acid, BSP, and ^{14}C-bilirubin after a single i.v. injection can be calculated from 3-exponent plasma clearance curves by a 3-compartment metabolic model. This model was derived from a 2-compartment model used to analyze 2-exponent plasma clearance curves after i.v. injection of these substances. Since plasma clearances after a single i.v. injection of ^{14}C-cholic acid, BSP, and ^{14}C-bilirubin can be described, in most cases, as 2- or 3-exponent, these substances can be employed as bile markers. By comparing calculated values for these substances and their concentrations measured in the bile or duodenal juice, it is possible to detect impairment of bile flow or a loss of hepatic bile on its course from the liver to a tube, no matter whether this loss results from discharge into the gallbladder or incomplete aspiration of duodenal juice.

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See also 2426, 2499, 2545, 2853, 2854, 3477, 3504, 3508, 3557, 3568, 3734, 3759, 3767.

SECRETION AND METABOLISM

Intestine

2784 BILE ACID INHIBITION OF INTESTINAL ANAEROBIC ORGANISMS. *(E.)* Binder, H. J.; Filburn, B.; Floch, M. (Dep. Intern. Med., Yale Univ., New Haven, Conn.). *Am. J. Clin. Nutr.* 28(2): 119-125, 1975.

The inhibitory effect of bile acids on *in vitro* growth of enteric anaerobic organisms was studied in fresh strains of intestinal bacteria isolated from stool cultures. Eleven strains of *Clostridia*, 15 of *Bacteroides*, 13 of *Lactobacillus*, and 12 of gram-negative enteric aerobes were used. The test media consisted of 3 ml each of bile acid or detergent solution and carbohydrate-free thioglycolate broth which was inoculated with an 18-hr broth culture of the test organism. Viable counts were made by quantitatively plating serial dilutions of the test cultures immediately and at 6-, 18-, or 34-hr intervals after the initiation of incubation. Unconjugated bile acids were immediately more effective in controlling the growth of enteric anaerobes than conjugated bile acids; the dihydroxy bile acids, chenodeoxycholic acid and deoxycholic acid, were more inhibitory than the trihydroxy acid, cholic acid. Greater inhibition was observed at pH 6.5 than at pH 7.5 but inhibition was prevented by the addition of lecithin to form mixed micelles. The inhibition by nonbile acid detergents and the failure of a nondetergent bile acid (dehydrocholic acid) to inhibit growth suggests that the mechanism of inhibition is related to the detergent properties of these bile acids. Growth of enteric aerobes was not inhibited by unconjugated bile acids. Although these studies have defined additional characteristics of intestinal anaerobe inhibition by bile acids, such as pH of the media and the presence of mixed micelles, the precise mechanism of this inhibition and potential physiological significance was not clearly established.

2785 THE MOVEMENT OF AN UNEMULSIFIED OIL TEST MEAL AND AQUEOUS- AND OIL-PHASE MARKERS THROUGH THE INTESTINE OF NORMAL AND BILE-DIVERTED RATS. *(E.)* Brand, S. J.; Morgan, R. G. H. (Dep. Physiol., Univ. West. Australia, Nedlands). *Q. J. Exp. Physiol.* 60(1):1-13, 1975.

The effect of bile diversion on gastric emptying and ileocecal transit was investigated by feeding an unemulsified oil test meal containing aqueous- and oil-phase markers (polyethylene glycol and ^{3}H-labeled triether) to control and bile fistula young male albino Wistar rats. Three groups of rats were used: Group I contained 17 internally bile-diverted rats; Group II contained 9 sham-operated animals; and Group III contained 16 control rats. Each rat was fed 0.5 ml of the test meal of unemulsified corn oil containing ^{3}H-labeled triether and ^{14}C-labeled triolein by gavage. The oil was immediately followed by 2 ml of a solution of 1% polyethylene glycol 4000 in 0.15 M NaCl. Rats were killed immediately or 2 or 4 hr after feeding and the gastrointestinal tract removed in 4 segments: stomach, proximal half of small bowel, distal half of small bowel, and cecum plus colon. The recovery of ^{14}C activity, ^{3}H activity (triether) and polyethylene glycol from each segment was calculated and expressed as a percentage of the dose fed. There was a close correlation between the recovery of triglyceride and triether at all levels of emptying, but triether was recovered in slight excess of triolein. There was a lower correlation between the gastric recovery of polyethylene glycol and ^{14}C-triglyceride; polyethylene moved ahead of the lipid phase in all groups. These results suggest that triether is a valid marker for following the movement of lipid through the bowel under the conditions of this study and that polyethylene glycol is of limited value as a marker. Triether:fat ratios indicated that fat absorption occurred largely from the upper small bowel in control animals and from the lower small bowel in the absence of bile. Bile diversion resulted in more rapid gastric emptying initially, but very slow gastric emptying of the last part of the test meal. Intestinal transit of test meal or either marker was not significantly affected by bile diversion. It is concluded that no evidence was found for a direct effect of bile diversion on gastrointestinal motility.

2786 EFFECT OF GASTROINTESTINAL HORMONES ON THE JEJUNAL AND ILEAL MUCOSA IN MICE AND HAMSTERS: HISTOPHYSIOLOGICAL STUDY. *(Fr.)*

Balas, D.; Senegas, F.; Frexinos, J.; Pradayrol, L.; Broussy, J.; Ribet, A. (Purpan Hosp., Paris, France). *Biol. Gastroenterol. (Paris)* 7:187-199, 1974.

After a 48 hr fast, mice and hamsters (mean age 3 months) received single i.p. injections of pentagastrin (3.6 or 12 μg/kg), secretin (1-10 U/kg), histamine (0.1-1 mg/kg), cholecystokinin-pancreozymin (CCK-PZ; 1-10 U/kg), cerulein (0.1-10 μg/kg), or serotonin (5-500 μg/kg) to determine the effects of these hormones on jejunal and ileal mucosa. While pentagastrin, secretin, and histamine had no appreciable effect on Paneth cells in either species, CCK-PZ, cerulein, and serotonin released zymogen granules from Paneth cells. CCK-PZ (doses of 2-3 U/kg) and cerulein (doses larger than 1 μg/kg) decreased the number of zymogen granules in Paneth cells 15-30 min after injection; this decrease was greater in hamsters than in mice. Between 60 and 90 min after injection, the number of zymogen granules increased again to levels above those in controls. While CCK-PZ (doses larger than 5 U/kg) increased the number of basal granules in mast cells in the crypts of Lieberkuhn in mice 30 to 75 min after injection, cerulein did not, even when administered in doses (10 μg/kg) larger than those needed to stimulate pancreatic and biliary secretion. Both CCK-PZ and cerulein stimulated maturation of granules in the Golgi apparatus. When administered in physiological doses, serotonin had no effect on Paneth cells, but at almost lethal doses (500 μg/kg) zymogen granules were rapidly released in both mice and hamsters. However, attempts to produce degranulation of Paneth cells *in vitro* with serotonin (10^{-6} to 1 mg/liter) were unsuccessful. Although these findings suggest that CCK-PZ and cerulein stimulate synthesis by increasing synthesis of granules in the Golgi apparatus, it cannot be ruled out that they act indirectly by stimulating production of pancreatic enzymes or bile. Large doses of serotonin may release zymogen granules by activating vagal centers; by producing a vagal effect locally by inhibiting cholinesterase, thus increasing accumulation of acetylcholine; and by increasing the frequency and amplitude of peristaltic activity, thus favoring the emptying and evacuation of secretion from intestinal glands.

2787 STIMULATION OF PROTEOLYTIC DIGESTION BY INTESTINAL GOBLET CELL MUCUS. *(E.)*

Shora, W.; Forstner, G. G.; Forstner, J. F. (Hosp. Sick Child., Univ. Toronto, Canada). *Gastroenterology* 68(3):470-479, 1975.

Intestinal goblet cell mucus from rat small intestine was added to incubations of casein and trypsin (or chymotrypsin) to determine whether mucus could inhibit proteolysis. Hydrolysis of α-casein by trypsin was used as a standard assay in the study. Goblet cell mucus stimulated casein hydrolysis, reaching a maximum effect at a mucus to casein ratio (w/w) of 0.083. Goblet cell mucus did not contain proteolytic enzymes or proenzymes as contaminants, nor did it serve as a substrate for trypsin. Stimulation was not reduced by removing 85% of the sialic acid from the goblet cell mucus. Pretreatment of casein by boiling and freezing decreased (50%) the goblet cell mucus effect, as did partial predigestion of casein by trypsin, and increasing trypsin concentration above 3 μg/ml. Goblet cell mucus also enhanced the hydrolysis by trypsin of intestinal brush border membrane protein, but had no effect on the hydrolysis of hemoglobin, albumin, or benzoyl arginine ethyl ester. It is suggested that goblet cell mucus interacts only with certain substrates (not the enzyme) to produce enhancement of trypsin hydrolysis.

2788 HYPERSENSITIVITY REACTIONS IN THE SMALL INTESTINE. I. THYMUS DEPENDENCE OF EXPERIMENTAL 'PARTIAL VILLOUS ATROPHY'. *(E.)*

Ferguson, A.; Jarrett, E. E. E. (West. Infirm., Glasgow, Scotland). *Gut* 16(2):115-117, 1975.

Small intestinal morphology was studied in thymus-deprived rats infected with *Nippostrongylus brasiliensis* to determine if the mechanism causing morphological changes could be immunological. Thymus-deprived Lister rats received whole-body irradiation and were infected between 1 and 3 months later with a s.c. injection of 4000 *N. brasiliensis* larvae. Six to 20 weeks after infection the animals were killed and sections of small intestine were prepared for histological study including measurements of villus height and crypt depth. Normal rats infected with *N. brasiliensis* showed crypt hyperplasia with villous atrophy in affected areas of the small intestine. In the thymus-deprived rats, the course of infection was prolonged, but the morphology appeared essentially normal in 70% of those animals. The findings suggest that the tissue damage associated with the *N. brasiliensis* infection is caused by a thymus-dependent immune reaction in the small intestine, and is not due simply to the toxic effects of the nematode.

2789 A ONE-STEP L-AMINO ACID OXIDASE ASSAY FOR INTESTINAL PEPTIDE HYDROLASE ACTIVITY.

(E.) Nicholson, J. A.; Kim, Y. S. (VA Hosp., San Francisco, Calif.). *Anal. Biochem.* 63(1):110-117, 1974.

A rapid 1-step assay for intestinal peptide hydrolase activity in mucosal homogenates, and in cytosol and particulate fractions prepared from homogenates has been developed. Mucosa from the proximal small intestine of male Wistar rats was used as the source of enzyme. Peptide hydrolysis, and estimation of liberated L-amino acids by use of L-amino acid oxidase, peroxidase, and a chromogen was achieved by a single incubation step. Each peptide was dissolved in 0.5 ml of 50 mM Tris-HCl, pH 8.0, and 1 ml of L-amino acid oxidase reagent (20 mg of L-amino acid oxidase, 2 mg of horseradish peroxidase, and 10 mg of *o*-dianisidine dissolved in 100 ml of Tris-HCl buffer pH 8.0) was added to these solutions. Tubes containing dipeptide substrate and L-amino acid oxidase reagent were maintained at 37 C and 25 µl of enzyme preparation was added. The reaction was stopped after a timed interval by addition of 0.74 ml 50% sulfuric acid, this amount giving optimal color development. Absorbance of the purple color was measured at 530 nm. The most suitable peptide substrates are dipeptides composed of 1 which does not react. Brush border peptide hydrolase activity may also be estimated with this assay by performing the incubation in the presence of *p*-hydroxymercuribenzoate. It is concluded that this method is simpler to perform than previously described 2-step methods and is especially useful in analyses of large numbers of samples.

2790 BILE SALT ALTERATION OF COLONIC ELECTROLYTE TRANSPORT: ROLE OF CYCLIC ADENOSINE MONOPHOSPHATE. *(E.)* Binder, H. J.; Filburn, C.; Volpe, B. T. (Dep. Intern. Med., Yale Univ., New Haven, Conn.) *Gastroenterology* 68(3):503-508, 1975.

The effect of bile salts on mucosal cyclic AMP (cAMP) levels and the effect of cAMP on ion transport were studied in rats. The cAMP content of the colonic mucosa of Sprague-Dawley rats was determined in two separate series of experiments during which mucosa was exposed to different bile salts under both *in vivo* and *in vitro* conditions. Colonic mucosal cAMP levels in the rat increased by 54% after *in vivo* incubation with taurochenodeoxycholic acid. Taurocholic acid, which neither induced fluid secretion nor increased short circuit current at concentrations at which taurochenodeoxycholic acid increased both, did not alter mucosal cAMP. Dibutyryl cAMP decreased net sodium absorption and increased short circuit current, findings which were qualitatively identical to those produced by taurochenodeoxycholic acid. These observations support the proposal that bile salts stimulate colonic electrolyte secretion by increasing mucosal cyclic AMP.

2791 RELATIONS OF WEAK-ELECTROLYTE TRANSPORT AND ACID-BASE METABOLISM IN RAT SMALL INTESTINE IN VITRO. *(E.)* Jackson, M. J.; Morgan, B. N. (George Washington Univ. Med. Cent., Washington, D.C.). *Am. J. Physiol.* 228(2):482-487, 1975.

The relations between the intestinal transport of weak electrolytes and the pattern of acid-base metabolism were studied in the rat small intestine *in vitro*. Tissue was taken from the jejunum and ileum of Wistar rats and used in two types of chamber preparations, one for the determination of weak-electrolyte fluxes and the other for studies of acid-base metabolism. Weak-electrolyte fluxes were estimated by the addition of 1mM benzoic acid or benzylamine to the incubation saline (kept at pH 7.3) and 0.5 µCi of ^{14}C-labeled tracer to one reservoir. The procedure used in the acid-base metabolism studies involved observation of pH changes in the mucosal and serosal fluids of the chamber system. The jejunal pattern of weak-electrolyte transport was net transport of weak acids from mucosal to serosal and of weak bases from serosal to mucosal; the pattern of acid-base metabolism was luminal acidification and serosal alkalinization. In the absence of sodium or in the presence of metabolic inhibitors, weak-electrolyte transport and serosal alkalinization were inhibited, but luminal acidification was not inhibited. The ileal pattern of weak-electrolyte transport was opposite that of the jejunum and could be associated with the presence of a luminal alkalinization process observed in that region. In the absence of chloride, the patterns observed in the ileum and jejunum were similar. The results confirm previous suggestions that the mechanisms for intestinal transport of weak electrolytes are related to asymmetries in the acid-base metabolism of the tissue.

2792 INTESTINAL LYMPH FORMATION AND FAT ABSORPTION: STIMULATION BY ACUTE ETHANOL ADMINISTRATION AND INHIBITION BY CHRONIC ETHANOL FEEDING. *(E.)* Baraona, E.; Lieber, C. S. (VA Hosp., Bronx, N.Y.). *Gastroenterology* 68(3):495-502, 1975.

The effects of both acute and chronic ethanol administration on the transport of dietary lipids into the lymph were studied in rats. To study the chronic effects of ethanol, rats were pair-fed liquid diets containing either ethanol (36% of calories) or isocaloric carbohydrate (control diet) for 3-4 weeks. The superior mesenteric lymph duct was cannulated and the accessory intestinal lymphatics were ligated. The acute effects of ethanol were assessed by comparing the response of the same animal to the randomized administration of ethanol, either in lipid emulsions administered intraduodenally or in liquid diets given by gastric tube. The acute administration of ethanol increased the flow of intestinal lymph and the output of proteins and dietary lipids into the lymph, primarily in the first hr after administration. During that time, the intraduodenal administration of ethanol (0.75 g/kg) without exogenous lipids increased the flow of lymph without changing the lymph lipid output. Stimulation of the lymph flow with neostigmine or by increasing the fluid load also enhanced the output of lymph proteins and the transport of exogenous lipids from the intestinal lumen into the lymph. The administration of an acute ethanol dose to rats chronically fed alcohol moderately increased the lymph flow but did not change the output of dietary lipids. Rats chronically fed alcohol responded to a dietary challenge devoid of ethanol with increases in both lymph flow and dietary lipid output, but the responses were smaller than in controls. The findings suggest that alcohol drinking may favor fat absorption temporarily, but the effect would tend to be abolished by prolonged ingestion of alcohol.

2793 PYRIMIDINE BIOSYNTHETIC ENZYMES IN RAT INTESTINE AFTER SMALL BOWEL RESECTION. *(E.)*

Nakayama, H.; Weser, E. (Univ. Texas Med. Sch., San Antonio). *Gastroenterology* 68(3):480-487, 1975.

Activities of the enzymes of pyrimidine biosynthesis were studied in rat intestine remaining after small bowel resection. Male Sprague-Dawley rats underwent resection of 50 cm of proximal or distal intestine or sham operation. At 1 and 6 months after surgery, aspartate transcarbamylase, dihydroorotase, and uridine kinase were assayed in whole mucosa and in crypt mucosa from the remaining intestinal segment. Determination of [^{3}H]thymidine incorporation into DNA was made 5 weeks after distal resection. In control bowel, enzyme activity was significantly greater in proximal compared with distal segments. One month after proximal or distal resection, mucosal weight and mucosal enzyme activity/cm of gut were greater in the remnant bowel compared with controls. There were no such differences at 6 months. Specific enzyme activity (including thymidine kinase) of isolated crypt mucosa was significantly increased 1 month after distal resection. In addition, [^{3}H]thymidine uptake into DNA of crypt mucosa from proximal remnants was also significantly increased. After small bowel resection, mucosal hyperplasia and an increase in nucleic acid synthesis and cell proliferation occur in the remaining segment, and the results indicate that the enzymes of pyrimidine biosynthesis also increase in the remaining bowel and parallel the accelerated rate of cell proliferation.

2794 DEOXYCHOLATE DEPRESSES SMALL-INTESTINE ENZYME ACTIVITY. *(E.)*

Gracey, M.; Houghton, M.; Thomas, J. (Princess Margaret Child. Med. Res. Found., Perth, Australia). *Gut* 16(1):53-56, 1975.

The effect of the deconjugated bile salt, sodium deoxycholate, on the activity of several small-intestine enzymes was studied in rats. Wistar rats were fed 25 mg sodium deoxycholate in their diet for 4 days; enzyme assays were done at 24-hr intervals following the bile salt feeding period. Oral administration of sodium deoxycholate caused depression of the activity of the small intestinal enzymes lactase, sucrase, maltase, alkaline phosphatase, and N-acetyl-β-glucosaminidase (a lysosomal enzyme). Alkaline phosphatase activity recovered rapidly and rose to above normal level within 24 hr after the animals resumed a normal diet. The activity of the three disaccharidases returned to normal within 7 days; there was no evidence of recovery of N-acetyl-β-glucosaminidase activity after 4 days of normal diet, and the degree of depression remained highly significant. The results show that sodium deoxycholate, when present in the lumen of the upper gut in excessive concentrations, may have harmful effects on intestinal digestive exzymes.

2795 MECHANISMS OF LIPID LOSS FROM THE SMALL INTESTINAL MUCOSA. *(E.)*

Waldram, R. (St. Thomas' Hosp., London, England). *Gut* 16(2):118-124, 1975.

Loss of lipids from the small intestinal mucosa was investigated by perfusion experiments in rats to show whether the loss is related to lipid solubility in the perfusion fluid. Wistar rats were prepared with a polyethylene cannula inserted into the small bowel. Perfusion fluids were 0.15 M NaCl/liter phosphate or glycine buffer solutions at pH 3.7, 5.4, and 9.7, with or without the addition of 5.7 or 11.4 mM taurocholic acid. Perfusates were extracted for estimation of DNA and for individual lipids (separated by thin-layer chromatography). No significant change in amounts of DNA or lipids was observed with time, with the exception of significantly more phosphatidyl choline in the first 11.4 mM taurocholic acid perfusion than in subsequent perfusates. Nor was there any significant difference in amounts of lipids or DNA in perfusates from fasted animals and those not fasted. Amounts of fatty acids were not related to DNA in any perfusion solution. The lipid compositions of mucosal cell suspensions and saline perfusates were found to be similar, except for fatty acids, which were found to be 18 times greater in the perfusates than in cell suspensions. The results suggest that free fatty acids reach the lumen by diffusion, that their solubility in the luminal fluid is a factor determining their rate of loss, and that triglycerides, cholesterol, phosphatidyl ethanolamine, and phosphatidyl choline are present only as the result of desquamation of mucosal cells.

2796 INTESTINAL METABOLISM OF PLASMA FREE FATTY ACIDS: INTRACELLULAR COMPARTMENTATION AND MECHANISMS OF CONTROL. *(E.)*

Gangl, A.; Ockner, R. K. (Univ. California Sch. Med., San Francisco). *J. Clin. Invest.* 55(4):803-813, 1975.

The metabolism of plasma free fatty acids in the intestinal mucosa of rats was investigated with particular regard to lipid absorption. [^{14}C]palmitic acid-rat serum complex was injected i.v. into Sprague-Dawley rats. Blood was collected at specified time intervals and the small intestine removed and prepared for analysis. Mucosal radioactivity was maximal 2 min after i.v. [^{14}C]palmitate. Of mucosal ^{14}C, 42% was in water-soluble metabolites, 28% in phospholipids, and 16% in triglycerides. The specific activity of mucosal triglyceride fatty acids was 11 times those of the serum, confirming *in situ* synthesis. Luminal fatty acids entering mucosa were chiefly esterified to triglycerides, while plasma free fatty acids were oxidized and incorporated into phospholipids. Mucosal metabolism of i.v. [^{14}C]palmitate was minimally affected by glucose administration; intraduodenal isocaloric ethanol inhibited mucosal oxidation of free fatty acids by 60% and nearly doubled their incorporation into triglycerides. During lipid absorption, mucosal uptake of plasma free fatty acids doubled and incorporation into intestinal lymph triglycerides was increased sixfold. Since similar activity was observed in both villi and crypts, it is suggested that the compartmentation of fatty acids is intracellular, that their metabolism in the epithelial cell appears to be determined by their site of entry into the cell, and in the fasting state plasma free fatty acids are both an energy source and a substrate for the synthesis of tissue phospholipid.

2797 CELLULAR ENZYMOLOGY OF THE HUMAN FOETAL INTESTINE. *(Fr.)* Tabbara, R.; Wegmenn, R. (French Fac. Med. Pharm., Beirut, Lebanon). *Ann. Histochim.* 19(1):77-83, 1974.

The activities of 32 enzymes were studied in the duodenum and jejunum of 4 human embryos, aged approximately 4 to 7.5 months. The activities of most enzymes were low at 4 months and increased with age. The exceptions were NADPH-tetrazolium réductase, lactate dehydrogenase, and peptidases which were highly active at 4 months, subsequently decreased, and later reached or exceeded their previous levels. Nucleic acids were present in large quantities throughout. However, at 4 months, no cell desquamation had occurred and nucleic acids were found in cells of the epithelium and chorion. After 7 months, desquamation was observed and meconium formed which contained large amounts of RNA and DNA. In general, metabolic activity was much lower in the chorion than in the epithelium. While variations in the activities of glucose-6-phosphatase, fructose-1,6-diphosphatase, lactate dehydrogenase, and glutamate dehydrogenase occurred in the epithelium, these variations were not found in the chorion.

2798 INFLUENCE OF SECRETIN AND CHOLECYSTOKININ ON MALTASE, SUCRASE AND LACTASE IN THE JEJUNUM OF THE RAT. *(E.)* Rommel, K.; Bohmer, R. (Dep. Clin. Chem., Univ. Ulm, Germany). *Digestion* 11(3/4): 194-198, 1974.

The activities of maltase, sucrase, and lactase were studied in rat intestinal mucosa, after injection of secretin or cholecystokinin. Wistar rats were fasted 12 hr and given either 1.5 U secretin or cholecystokinen i.v. Controls were given an equivalent volume of 0.9% saline. A segment of small intestine 20-40 cm from the pylorus was removed, the mucosa scraped off and the maltase, sucrase, and lactase activities determined. Maltase activity after secretin injection was 484.2 IU/mg protein as compared to a control value of 258.2 IU/mg protein. Sucrase activity was likewise raised from 62.1 to 121.5 IU/mg protein, while lactase activity was unaffected. Cholecystokinin caused no changes in any of the enzyme activities studied. It is concluded that there is a direct or indirect effect of secretin on synthesis or activation of maltase and sucrase.

2799 ANIMAL EXPERIMENTS ON METABOLIC CHANGES AND FECAL BILE ACID EXCRETION AFTER ILEAL RESECTION. *(Ger.)* Merkle, P.; Hartung, H.; Merkle, N.; Maurer, M. (Surg. Clin., Univ. Freiburg, Germany). *Bruns Beitr. Klin. Chir.* 221(8):638-642, 1974.

The distal half of the small intestine was resected, and a side-to-side anastomosis was made between the proximal stump of the small intestine and the cecum in 10 male and female rabbits. Blood samples were taken before surgery and at 2 week intervals thereafter for determination of Na^+, K^+, total protein, cholesterol, and triglyceride concentrations. Bile acid concentrations were determined on feces collected at the same times. Following administration of ^{131}I-labeled triolein, triglyceride absorption was measured 8 weeks after surgery. Serum electrolyte levels and triglyceride absorption remained unchanged after surgery, but serum triglyceride levels decreased slightly and cholesterol values by 50% 2-8 weeks after surgery. No change occurred in fecal bile acid excretion or in the consistency of the stools after surgery. These changes which differ greatly from those found in humans who have undergone ileectomy or who have ileal disease, indicate that resection of the distal small intestine in the rabbit does not increase bile acid synthesis or reabsorption. The decrease in serum cholesterol levels after enterectomy is attributed to decreases in cholesterol synthesis and absorption which normally occur in the small intestine.

2800 THE MORPHOLOGY AND ENZYME ACTIVITIES IN RAT SMALL INTESTINE DURING ORAL ADMINISTRATION OF NEOMYCIN AND GLIADIN-FREE AND GLIADIN-CONTAINING DIETS. *(Ger.)* Lucking, T. (Pediatr. Clin., Univ. Hamburg, Germany). *Z. Gastroenterol.* 13(2):362-367, 1975.

Of 40 male Wistar rats, 20 received a synthetic diet containing 5% gliadin, 15% casein, 65% sucrose, 15% corn oil, and a vitamin and mineral supplement while the remaining 20 were given a gliadin-free diet containing 20% casein. Starting 8 days later, 10 rats in each group received 12 mg/ml neomycin sulfate in their drinking water. After a 12 hr fast, rats were sacrificed 21 days later. All animals lost weight during the experiment. Those receiving neomycin lost more weight than controls, even those that also received gliadin. Neomycin-treated rats, both those given gliadin-free and gliadin-containing diets, showed much less spontaneous activity after 2 weeks of treatment than the controls. They ate and drank less so that their mean weights decreased from 150 g to 94.5 g in the group receiving gliadin and to 87.1 g in the group receiving the gliadin-free diet. Examination of the mucosa of the small intestine under a stereomicroscope showed no morphological differences between these four groups of rats. The activities of lactase, sucrase, maltase, glycyl-L-leucine dipeptidase, L-alanyl-L-leucine dipeptidase, acid and alkaline phosphatase, and β-glucuronidase, determined on supernatants from homogenized mucosa from the small intestine, were the same in all four groups of rats. From these results it is concluded that neomycin has some kind of toxic effect on rats although it causes no morphological or enzymatic changes in the small intestine.

2801 CHANGES IN DISACCHARIDASE ACTIVITIES IN THE SMALL INTESTINAL MUCOSA OF THE RAT AFTER A SINGLE DOSE OF 5-FLUOROURACIL. *(Ger.)* Mielke, F. (Charlottenburg Clin., Berlin, Germany). *Z. Gastroenterol.* 13(2):356-361, 1975.

A single dose of 40 mg 5-fluorouracil was injected i.p. into 70 female Wistar rats which were then sacrificed in groups of 10 each 24 to 168 hr later. This dose is 3 times that used therapeutically. Untreated rats served as controls. All animals were fasted for 24 hr before sacrifice. No gross morphological changes were found in the small intestine following administration of 5-fluorouracil. Disaccharidase activities, determined on homogenates of mucosa from the small intestine, were decreased after 48 hr: maltase activities by 13%, trehalase by 59%, lactase by 52%, and cellobiase by 61%. Except for maltase activities which reached a minimum 60 hr after injection, disaccharidase activities were lowest after 72 hr. At this time maltase activities were decreased by 40%, trehalase by 75%, lactase by 87%, and cellobiase by 94%. A significant increase in the activities of all enzymes occurred after 96 hr, but increased became more gradual thereafter. Even after 7 days, none of the enzymes had reached their initial levels. Maltase and trehalase activities were 4% and 10%, resp., below control values, while lactase and cellobiase were 26% and 28%, resp., lower. These findings, which agree with others in the literature, suggest that the first cell population covering the villi 96 hr after administration of 5-fluorouracil are not functionally mature. Absorption and digestion have almost normalized by the time the next cell population reaches the ends of the villi.

2802 THE INTESTINAL CELL: FINDINGS ON ITS MORPHOLOGY AND METABOLIC FUNCTIONS. CHANGES DURING ISCHEMIA AND EXPERIMENTAL VENOUS STASIS. *(Fr.)* Cougard, A.; Chamlian, A.; Minges, H. (no affil.). *Ann. Anesthesiol. Fr.* 15(Suppl. 1):1-13, 1974.

2803 CYTOMORPHOLOGICAL AND ENZYME-HISTOCHEMICAL ASPECTS OF THE INTESTINAL MUCOSA IN COMPLETE STARVATION. *(Ger.)* Schafer, A.; Hohn, P.; Gabbert, H.; Paasch, W. (Pathol. Inst., Univ. Mainz, Germany). *Verh. Dtsch. Ges. Pathol.* 57:389, 1973.

2804 THE RELATIONSHIP BETWEEN THE INTESTINAL RELEASE OF LYSOMAL ENZYMES AND CARDIOTOXIC MATERIAL DURING REGIONAL SIMULATED SHOCK: AN EXPERIMENTAL STUDY IN THE C.T. *(E.)* Haglund, U.; Lundholm, K.; Lundgren, O.; Schersten, T. (Dep. Surg. II, Univ. Goteberg, Sweden). *Circ. Shock.* 2 (1):49-56, 1975.

2805 SPECIFICITY OF THE ACTION OF PHOSPHOLIPASES FROM RAT INTESTINAL MUCOSA. *(Fr.)* Bonnefis, M. J.; Lloveras, J.; Douste-Blazy, L. (Purpan Hosp., Toulouse, France). *C. R. Acad. Sci.* [*D*] *(Paris)* 280(5):661-664, 1975.

2806 INHIBITION BY OXOTREMORINE OF ACETYLCHOLINE RESTING RELEASE FROM GUINEA PIG-ILEUM LONGITUDINAL MUSCLE STRIPS. *(E.)* Kilbinger, H.; Wagner, P. (Pharmacol. Inst., Univ. Mainz, Germany). *Naunyn Schmiedebergs Arch. Pharmacol.* 287(1):47-60.

2807 METABOLISM OF RECTOCOLONICALLY ADMINISTERED, SATURATED TRIGLYCERIDES IN THE COURSE OF CHRONIC ABSORPTION TESTS IN THE RABBIT. *(Fr.)* Bacques, C.; Dorier, A. (Lab. Physiol., I. U. T., Lyon, France). *J Physiol.* (Paris) 69(Suppl):138A, 1974.

2808 BIOSYNTHESIS AND DEGRADATION OF METHYLMERCURY IN HUMAN FAECES. *(E.)* Peaker, M.; Linzell, J. L. (ARC Inst. Anim. Physiol., Cambridge, England). *Nature* 253(5491):462-464, 1975.

2809 CONTINENT COLOSTOMY: AN EXPERIMENTAL STUDY IN DOGS. *(E.)* Kock, N. G.; Geroulanos, S.; Hahnloser, P.; Schauwecker, H.; Sauberli, H. (Canton. Hosp., Zurich, Switzerland). *Dis. Colon Rectum* 17(6):727-734, 1974.

2810 ROLE OF LYSOSOMES IN CARRAGEENAN-INDUCED CECAL ULCERATION. *(E.)* Abraham, R.; Fabian, R. J.; Golberg, L.; Coulston, F. (Albany Med. Coll., N.Y.). *Gastroenterology* 67(6):1169-1181, 1974.

2811 ENERGY ROLE OF DIETARY CARBOHYDRATES IN THE INTESTINAL EPITHELIUM: PROSPECTS FOR MICROCALORIMETRIC STUDIES. *(Ger.)* Hellauer, H.; Winkler, R. (no affil.). *Zuckerforsch. Inst.* 107-108, 1973/74.

2812 LACTASE ACTIVITY OF THE MUCOSA OF THE SMALL INTESTINE IN DOGS WITH EXPERIMENTAL PANCREATITIS. *(Ukr.)* Levytskyi, A. P.; Redchits, P. S. (Odessa Med. Inst., USSR). *Fiziol. Zh.* 20(6): 823-824, 1974.

2813 THE SPECIFICITY OF ENZYME SECRETION IN THE INTESTINE. *(Fr.)* Roduner, J.; Honegger, J.; Hesford, F.; Hadorn, B. (Univ. Pediatr. Hosp., Bern, Switzerland). *Biol. Gastroenterol. (Paris)* 7(4):301, 1974.

2814 THE DETERMINATION OF LACTASE, MALTASE AND ALKALINE PHOSPHATASE ACTIVITY IN THE SMALL INTESTINAL MUCOSA OF HEALTHY PEOPLE. *(Rus.)* Bobkova, E. D.; Iuschuk, N. D.; Shalygina, N. B. (Cent. Sci. Res. Inst. Epidemiol., Moscow, USSR). *Lab. Delo* (3):160-162, 1975.

2815 DISACCHARIDASE ACTIVITY IN THE SMALL INTESTINE OF ADULTS. *(Ger.)* Madzarovova-Nohejlova, J. (1st Med. Clin., Charles Univ., Plzen, Czechoslovakia). *Dtsch. Z. Verdau. Stoffwechselkr.* 34(2-4):229-231, 1974.

2816 DIGESTIVE ENZYMES IN THE SMALL INTESTINE AND PANCREAS OF GERM-FREE ANIMALS. *(Ger.)* Malis, F.; Fric, P.; Lojda, Z.; Stepankova, R.; Kruml, J. (Med. Fac., Charles Univ., Prague, Czechoslavakia). *Dtsch. Z. Verdau. Stoffwechselkr.* 34(2-4): 225-228, 1974.

2817 EFFECT OF SECRETIN AND CHOLECYSTOKININ-PANCREOZYMIN ON INTESTINAL DISACCHARIDASES AND MONOSACCHARIDE ABSORPTION IN THE RAT. *(Ger.)* Bohmer, R.; Rommel, K.; Welter, D. (Inst. Clin. Chem., Univ. Ulm, Germany). *Z. Gastroenterol.* 12 (Suppl.):427-428, 1974.

2818 ENZYME CYTOCHEMISTRY OF THE HUMAN SMALL INTESTINAL MUCOSA UNDER NORMAL AND PATHOLOGICAL CONDITIONS. *(Ger.)* Riecken, E. O. (Med. Clin., Univ. Marburg/Lahn, Germany). *Z. Gastroenterol.* 13(Suppl.):210-222, 1975.

2819 THE DIGESTIVE AND ABSORPTION FUNCTIONS OF SMALL INTESTINAL MUCOSA. *(Ger.)* Caspary, W. F. (Med. Clin., Univ. Gottingen, Germany). *Z. Gastroenterol.* 13(Suppl.):223-243, 1975.

2820 EFFECT OF CERULEIN ON ENZYME SECRETION IN THE ISOLATED SMALL INTESTINE OF THE RAT. *(Fr.)* Vaultier, J. P.; Mirhom, R.; Eloy, R.; Vasseur, M.; Jaeck, D.; Grenier, J. F. (INSERM Unit 61, Strasbourg-Hautepierre, France). *Biol. Gastroenterol. (Paris)* 7(4):303-304, 1974.

2821 EFFECT OF GASTROINTESTINAL HORMONES ON AMYLASE ACTIVITY IN INTESTINAL JUICE IN THE HAMSTER. *(Fr.)* Senegas, F.; Balas, D.; Ribet, A. (Purpan Hosp., Toulouse, France). *Biol. Gastroenterol. (Paris)* 7(4):302-303, 1974.

2822 STUDY OF INTESTINAL AMYLASE IN THE HAMSTER: COMPARISON WITH SALIVARY AND PANCREATIC AMYLASE. *(Fr.)* Laval, J.; Pradayrol, L.; Balas, D.; Ribet, A. (Purpan Hosp., Toulouse, France). *Biol. Gastroenterol. (Paris)* 7(4):302, 1974.

2823 INTESTINAL CALCIUM-BINDING PROTEIN IN ANIMALS FED NORMAL AND RACHITOGENIC DIETS: I. RAT STUDIES. *(E.)* Harrison, J. E.; Hitchman, A. J. W.; Tam, C. S. (Dep. Med., Univ. Toronto, Canada). *Can. J. Physiol. Pharmacol.* 53(1):137-143, 1975.

2824 ACID HYDROLASES IN THE SUCKLING RAT SMALL INTESTINE. II. ON THE IMPORTANCE OF ALKALINE PHOSPHATASE INHIBITION IN THE HISTOCHEMICAL LOCALIZATION OF ACID PHOSPHATASE ACTIVITY. *(E.)* Connock, M. J.; Sturdee, A. P. (Dep. Biol. Sci., Polytech., Wolverhampton, England). *Histochem. J.* 7(2):103-114, 1975.

2825 THE DEMONSTRATION OF O-ACETYLATED SIALIC ACIDS IN COLONIC EPITHELIAL GLYCOPROTEINS. *(E.)* Reid, P. E.; Culling, C. F. A.; Tsang, W. C.; Clay, M. C.; Ramey, C. W.; Dunn, W. L. (Fac. Med., Univ. British Columbia, Vancouver, Canada). *Can. J. Biochem.* 53(3):388-391, 1975.

2826 EVIDENCE FOR THE ROLE OF 1,25-DIHYDROXYCHOLECALCIFEROL (1,25-DHCC) IN ACUTE LOW CALCIUM ADAPTATION. *(E.)* Pento, I. T.; Badeen, R. L. (Dep. Pharmacol., Univ. Oklahoma, Norman). *Fed. Proc.* 34(3):894, 1975.

2827 EFFECT OF QUALITY AND QUANTITY OF DIETARY FAT ON SENSITIVITY OF COLON TO CARCINOGENIC EFFECT OF 1,2-DIMETHYLHYDRAZINE IN RATS. *(E.)* Reddy, B. S.; Narisawa, T.; Vukusich, D.; Mangat, S.; Wynder, E. L.; Weisburger, J. H. (Am. Health Found., New York, N.Y.). *Fed. Proc.* 34(3):900, 1975.

2828 QUANTITATION OF TRYPTOPHAN METABOLITES IN RAT FECES BY THIN-LAYER CHROMATOGRAPHY. *(E.)* Anderson, G. M. (Natl. Cancer Inst., Frederick Can. Res. Cent., Md.). *J. Chromatogr.* 105(2):323-328, 1975.

2829 GLUCURONIDATION OF 1-NAPTHOL IN THE RAT INTESTINAL LOOP. *(E.)* Bock, K. W.; Winne, D. (Inst. Toxicol., Tubingen, Germany). *Biochem. Pharmacol.* 24(8):859-862, 1975.

2830 ENDOTOXIN AND PRODUCTION OF PROSTAGLANDINS BY THE ISOLATED RABBIT JEJUNUM. INFLUENCE OF INDOMETHACIN. *(E.)* Herman, A. G.; Vane, J. R. (R. Coll. Surg. England, London). *Arch. Int. Pharmacodyn. Ther.* 213(2):328-329, 1975.

See also, 2430, 2505, 2654, 2717, 2728, 2838, 3020, 3758.

2831 RADIOMETRIC ESTIMATION OF THE AMOUNT OF SOLID GASTROINTESTINAL CONTENTS. *(E.)* Pfau, A.; Abadir, F. A. (Inst. Anim. Husb. Anim. Behavior, Mariensee, Germany). *Experientia* 30(11): 1296-1298, 1974.

The estimation of solid gastrointestinal contents by dilution techniques using radioactive markers was investigated in 12 78-week-old bulls. ^{152}Eu was used as the marker of the solid phase and ^{14}C-polyethyleneglycol (PEG) as marker of the liquid phase. The markers were administered in aqueous solutions *via* stomach tube or rumen fistula. Except for ^{14}C-PEG in ruminal fluid, all the other turnover rate constants for ^{152}Eu and ^{14}C-PEG in rumen or feces appeared to be almost identical. The solid phase in cattle gastrointestinal tract, therefore, could be described with a one-compartment model but at least two components are necessary to describe the fluid phase. These findings led to the conclusion that it is justified to use the ^{152}Eu fecal excretion measurements for determining the turnover rate of the ruminal solid phase even if other factors indicated different compartments to be assayed by fecal and ruminal estimates. Values obtained by this procedure *in vivo* demonstrated good agreement with gravimetric measurements after slaughter. The amount of dry matter in the intestine corresponded fairly well to the values from radiometric measurements on healthy bulls. It is suggested that ^{152}Eu dilution analysis might be of use for the estimation of the amount of solid contents in the intestine. However, without further measurements or assumptions, the wet content of the rumen or gastrointestinal tract cannot be obtained with this technique.

2832 EFFECT OF EXPOSURE TO HYPEROXIC, HYPOBARIC, AND HYPERBARIC ENVIRONMENTS ON CONCENTRATIONS OF SELECTED AEROBIC AND ANAEROBIC FECAL FLORA OF MICE. *(E.)* Gillmore, J. D.; Gordon, F. B. (Nav. Med. Res. Inst., Bethesda, Md.). *Appl. Microbiol.* 29(3):358-367, 1975.

Alterations in selected aerobic and anaerobic fecal microflora of the mouse were determined during exposure to hyperoxic and normoxic hypo- and hyperbaric environments. Examination of fecal cultures obtained during exposure of female NMRI Swiss mice for 6 weeks to 60 or 77% oxygen concentration at 1 atmosphere absolute revealed little alteration in the aerobic or anaerobic flora. There appeared to be only a retardation in the reduction of the *Klebsiella-Enterobacter* flora which normally occurs after weaning. During exposure to hypobaric environments (100% O_2, 0.2 atmosphere absolute), significant alteration (increases) in the concentrations of *Escherichia coli*, slow lactose fermenters, *Klebsiella-Enterobacter*, and enterococci were found in some instances. Variations in the concentrations of different colony types of obligately anaerobic gram-positive and gram-negative rods cultured during the same experiments also occurred. One colony type of gram-positive rods appeared to decrease, while a second type increased. The concentrations of three colony types of gram-negative rods were generally, but not always, increased. During hyperbaric exposure (2.8% O_2, 7.5 atmospheres absolute), increased concentrations of *Klebsiella-Enterobacter*, *E. coli*, slow lactose fermenters, and enterococci were noted. Changes in the numbers of both colony types of gram-positive rods, when occurring, were in the direction of lower numbers. Alterations in the numbers of gram-negative rods were in both directions but were more frequently in the direction of higher numbers. After return to normal air following 4 weeks of hypo- or hyperbaric exposure, the fecal concentrations of most organisms tended to revert toward control values; the gram-positive rods, however, remained in reduced concentrations. These data indicate that, despite the great variation in the fecal flora among individual mice, it is possible to discover the effects induced by altered gaseous environments.

2833 MECHANISM OF BLOODY DIARRHEA IN SHOCK. *(E.)* Crowell, J. W.; Nelson, Jr., K. M. (Univ. Mississippi Med. Cent., Jackson). *Circ. Shock* 2(1):21-28, 1975.

Ink was injected i.v. into anesthetized adult mongrel dogs to study the effect of shock on liver microcirculation. Prior to ink injection, the animals were subjected to hemorrhagic shock, hemorrhagic shock and hepatic artery occlusion, hepatic vein occlusion, or hepatic vein occlusion and portal diversion. In 10 normal control dogs, ink was evident after 3 hr from the triad to the central vein of the liver, although it was most dense in the triad area. After irreversible hemorrhagic shock, ink was still evident in the triad area but none was evident in the central vein area. Occlusion of the hepatic vein with the portal blood diverted into the femoral vein caused an ink pattern similar to that seen after hemorrhagic shock. Ligation of the hepatic artery after hemorrhagic shock resulted in a total absence of ink in large areas of the liver, with other areas showing ink in the same pattern observed in the controls. Hepatic vein occlusion without hemorrhagic shock resulted in an ink pattern similar to that seen in controls, but the ink was less dense. In the latter group, the liver was greatly enlarged. Portal blood by-pass resulting in the prevention of a high portal pressure prevented bloody diarrhea. The mechanism of bloody diarrhea in shock appears to be as follows. In low flow states, hypoxia causes swelling of the centrilobular liver cells with blockage of some of the sinusoids. The increase in portal resistance, the entrance of high pressure arterial blood into the portal system, and intestinal hyperemia all combine to cause a high portal pressure which destroys the intestinal mucosa and allows fluid and blood to enter the lumen; the result is bloody diarrhea.

2834 DETECTION OF A VACCINE ANTIGEN IN THE SUPERNATANT OF A Salmonella typhimurium (STRAIN M-206) CULTURE. *(Fr.)* Ivanoff, B.; Creach, O.; Delorme, P.; Laval, F.; Fontanges, R. (Res. Cent., Army Health Dep., Lyon, France). *C. R. Acad. Sci.* [*D*] *(Paris)* 280(6):791-793, 1975.

2835 INTESTINAL BACTERIAL REDUCTION OF 4,4'-DIHYDROXYSTILBENE TO 4,4'-DIHYDROXYBIBENZYL. *(E.)* Tay, L. K.; Sinsheimer, J. E. (Coll. Pharm., Univ. Michigan, Ann Arbor). *J. Pharm. Sci.* 64(3): 471-472, 1975.

2836 THE IN VIVO REDUCTION OF COMPOUNDS CONTAINING THE NITRO GROUP: ITS RELATION TO THE CHARACTER OF THE INTESTINAL MICROFLORA. *(E.)* Wheeler, L. A.; Soderberg, F.; Goldman, P. (Harvard Med. Sch., Boston, Mass.). *Fed. Proc.* 34(3):742, 1975.

2837 THE ESTERIFICATION OF LITHOCHOLIC ACID BY FECAL MICROORGANISMS. *(E.)* Kelsey, M. I.; Thompson, R. J. (Natl. Cancer Inst. Frederick Cancer Res. Cent., Md.). *Fed. Proc.* 34(3):560, 1975.

2838 CHOLIC ACID-INDUCED INCREASES IN INTESTINAL MUCOSAL RENEWAL RATES AND RADIOSENSITIVITY IN GERMFREE CFW MICE. *(E.)* Mastromarino, A.; Wilson, A. (Baylor Coll. Med., Houston, Tex. *Fed. Proc.* 34(3):916, 1975.

2839 CITRIC, OROTIC, AND OTHER ORGANIC ACIDS IN RATS INJECTED WITH ACTIVE OR INACTIVE UREASE. *(E.)* Prior, R. L.; Zimber, A.; Visek, W. J. (Dep. Anim. Sci., Cornell Univ., Ithaca, N. Y.). *Am. J. Physiol.* 228(3):828-833, 1975.

2840 INFLUENCE OF SHORT TERM FASTING ON ALIMENTARY CANAL MUCOSA. *(E.)* Bayer, R. C.; Bird, F. H.; Chawan, C. B.; Smith, M. A. (Dep. Anim. Vet. Sci., Univ. Maine, Orono.). *Fed. Proc.* 34(3): 916, 1975.

2841 EFFECT OF ^{90}Y INHALED IN FUSED CLAY PARTICLES ON THE GASTROINTESTINAL TRACT OF BEAGLES. *(E.)* Hahn, F. F.; Barnes, J. E.; Hobbs, C. H.: Mauderly, J. L. (Inhalation Toxicol. Res. Inst., Lovelace Found., Albuquerque, N.M.). *Radiat. Res.* 61(3): 444-456, 1975.

2842 CHROMATOGRAPHIC DETECTION OF MELATONIN (5-METHOXY-N-ACETYLTRYPTAMINE) AND ITS BIOLOGICAL PRECURSORS IN ENTEROCHROMAFFIN CELLS. *(Rus.)* Kvetnoi, I. M.; Raikhlin, N. T.; Tolkachev, V. N. (Inst. Exp. Clin. Oncol., Moscow, USSR). *Dokl. Akad. Nauk SSSR* 221(1):226-227, 1975.

2843 EXPERIMENTAL PROTEIN-CALORIE MALNUTRITION IN THE RAT: BLOOD CHEMISTRY AND ETHANOL INFLUENCE. *(E.)* Jaggannathan, S. N.; Rodman, N. F. (Dep. Pathol., West Virginia Univ., Morgantown). *Fed. Proc.* 34(3):895, 1975.

2844 EFFECT OF THE LIVER ON THE PLASMA HISTAMINE CONCENTRATION. MEASUREMENTS PERFORMED ON PRE-AND POSTHEPATIC BLOOD BEFORE AND AFTER ABDOMINAL SURGERY. *(Ger.)* Beger, H. G.; Stopik, D.; Bittner, R.; Kraas, E.; Roscher, R. (Westend Clin., Free Univ. Berlin, Germany). *Z. Gastroenterol.* 12 (Suppl.):405-406, 1974.

2845 EFFECTS OF ACUTE SEVERE HEMORRHAGE ON HEMODYNAMICS AND METABOLISM OF THE BABOON INTESTINE. *(E.)* Alteveer, R. J.; Reed, E. A. (Hahnemann Med. Coll., Philadelphia, Pa.). *Fed. Proc.* 34(3):379, 1975.

2846 EFFECT OF INTRAVENOUS CHOLECYSTOKININ AND ISOPROTERENOL AND INTRADUODENAL FAT ON JEJUNAL BLOOD FLOW DISTRIBUTION. *(E.)* Fara, J. W.; Campbell, R.; Madden, K. (Dep. Physiol. Biophys., State Univ. New York, Stony Brook). *Fed. Proc.* 34 (3): 460, 1975.

2847 EFFECTS OF CHOLECYSTOKININ-OCTAPEPTIDE (CCK-OP) ON HYPOTHALMIC ELECTRICAL ACTIVITY. *(E.)* Dafny, N.; King, M. C.; McClung, R.; Jacobson, E. D. (Univ. Texas Med. Sch., Houston). *Fed. Proc.* 34(3):441, 1975.

2848 LIVER BLOOD FLOW AND BLOOD VOLUME FOLLOWING CHRONIC PHENOBARBITONE ADMINISTRATION. *(E.)* Ohnhaus, E. E.; Lochner, J. T. (Dep. Med., Univ. Bern, Switzerland). *Eur. J. Pharmacol.* 31(2):161-165, 1975.

2849 THE EFFECT OF PROPRANOLOL AND PHENTOLAMINE ON HYPERGASTRINEMIA RESULTING FROM RESPIRATORY ACIDOSIS IN NORMAL SUBJECTS. *(Fr.)* Kaess, H.; Teckentrupp, G.; Hauck, A.; Dorner, M. (Ludolph Krehl Clin., Heidelberg, Germany). *Biol. Gastroenterol. (Paris)* 7(4):297, 1974.

2850 EFFECT OF PROSTAGLANDINS E_1 AND A_2 ON PROLIFERATION AND PHAGOCYTOSIS OF CULTURES OF MOUSE PERITONEAL MACROPHAGES. *(Fr.)* Pelletier, M.; Adolphe, M.; Fontagne, J.; Timsit, J.; Lechat. P. (CNRS Lab. No. 206, Pract. Sch. Higher Stud. Paris, France). *C. R. Acad. Sci.* [*D*] *(Paris)* 280(10):1317-1320, 1975.

2851 ELECTROFOCUSING STUDY OF INTESTINAL MALTASE FROM THE RAT DISSOLVED BY PAPAIN AND DIGITONIN. *(Fr.)* Sudaka, P.; Delmont, J.; Rigat, A. M. (Fac. Med., Nice, France). *Biol. Gastroenterol. (Paris)* 7(4):305-306, 1974.

2852 ENTERO-BACTERIAL FORMATION OF CYCLOHEXYLAMINE IN RATS INGESTING CYCLAMATE. *(E.)* Bickel, M. H.; Burkhard, B.; Meier-Strasser, E.; Ven Den Broek-Boot, M. (Med. Chem. Inst., Univ. Bern, Switzerland). *Xenobiotica* 4(7):425-439, 1974.

2853 THE EFFECT OF γ-IRRADIATION ON THE HEPATIC TRANSPORT OF AMINO ACIDS. *(E.)* Flory, W.; Jennewein, S. (Dep. Biochem., Univ. South Dakota, Vermillion). *Fed. Proc.* 34(3):556, 1975.

2854 EFFECT OF AMINO ACID TRANSPORT ON THE ACCUMULATION OF LIVER GLYCOGEN IN RATS AFTER WHOLE-BODY IRRADIATION. *(E.)* Kilberg, M.; Neuhaus, O. W. (Dep. Biochem., Univ. South Dakota, Vermillion). *Fed. Proc.* 34(3):556, 1975.

2855 THE RELATIONSHIP OF INTESTINAL ADHESIONS TO INFRARED HEATING LAMP EXPOSURE. *(E.)* Arima, E,; Fonkalsrud, E. W. (Sch. Med., Univ. California, Los Angeles). *J. Pediatr. Surg.* 10(2):231-234, 1975.

2856 OBLIGATORY URINARY AND FECAL NITROGEN LOSSES IN ELDERLY WOMEN. *(E.)* Perera, W. D. A.; Young, V. R.; Scrimshaw, N. S. (Massachusetts Inst. Technol., Cambridge). *Fed. Proc.* 34(3):930, 1975.

2857 BINDING OF ACETYLCHOLINESTERASE TO VARIOUS LIPIDS. *(E.)* Struve, W. G.; Watkins, M. S.; Goldstein, D. J.; Bulger, J. E. (Cent. Health Sci., Univ. Tennessee, Memphis). *Fed. Proc.* 34(3): 326, 1975.

2858 EFFECTS OF MANIPULATION, DISTENSION AND PHYSOSTIGMINE ON COMPARTMENTAL BLOOD FLOW IN THE CANINE G-I TRACT. *(E.)* Grassmick, B.; Chou, C. C. (Dep. Physiol., Michigan State Univ., East Lansing). *Fed. Proc.* 34(3):460, 1975.

2859 INCREASE IN THE QUANTITY OF METABOLIC FECAL NITROGEN IN THE RAT FOLLOWING INGESTION OF DIETS CONTAINING TANNIC ACID. *(Fr.)* Mitjavila, S.; Mitjavila, S.; Derache, R. (Inst. Physiol., Toulouse, France). *Ann. Nutr. Alim.* 28(3):189-198, 1974.

2860 ELECTROMYOGRAPHIC STUDY OF DIAPHRAGMATIC MOTOR ACTIVITY DURING VOMITING IN THE NON-ANESTHETIZED DOG. *(Fr.)* Monges, H.; Salducci, J.; Naudy, B. (Clin. Gastrointest. Dis. Nutr., Marseille, France). *Biol. Gastroenterol. (Paris)* 7(4):291, 1974.

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2861 150 PANCREATIC SCINTIGRAPHIC ANALYSES. COMPARISON OF RADIOCLINICAL AND SURGICAL FINDINGS. *(Fr.)* Batisse, R.; Charbord, P. (Val-de-Grace Hosp., Paris, France). *Ann. Med. Interne (Paris)* 125(10):731-736, 1974.

Comparisons were made of clinical, biological, radiological, scintigraphic, and surgical findings on 89 patients. These patients had acute or chronic pancreatitis (25 cases), cancer of the pancreas (7), pancreatic shunts (3), obstructions of the papilla (2), primary adenocarcinoma of the liver (1), Zollinger-Ellison syndrome (1), and pancreatic ischemia caused by stenosis of the celiac trunk (1); 49 patients had no pancreatic abnormalities. Pancreatic scintigrams were obtained by double labelling with ^{75}Se-selenomethionine and ^{99m}Tc and subtraction of the liver scan. In all but 10% of these patients, accurate diagnoses were established from pancreatic scans. In patients with atypical abdominal pain, normal scans often made it possible to rule out chronic pancreatitis. The only exceptions were those with caudal lesions, which are difficult to detect and which are usually found in alcoholics at the onset of chronic pancreatitis. Scans from patients with caudal lesions were difficult to interpret because of the small size of the organ and because loops of jejunum or a hyperplastic left lobe of the liver, such as that found in alcoholics, were superimposed on the scan. In patients with acute pancreatitis, pancreatic scans confirmed the diagnosis based on clinical and biochemical findings. Lesions less than 2 cm in diameter, which were found in nodular pancreatitis and cancer, were not detected on pancreatic scans. However, cancer of the head of the pancreas was accompanied by readily detectable stasis in the pancreatic duct above the tumor.

2862 RAPID METHOD FOR DOUBLE CONTRAST RADIOGRAPHY OF THE COLON: UTILIZATION OF GLUCAGON. *(Fr.)* Hage, G. (St. Marguerite Hosp., Marseille, France). *Arch. Fr. Mal. App. Dig.* 63(4): 297-303, 1974.

A new method for obtaining double contrast x-rays of the terminal ileum and colon was used on 130 patients (58 females and 72 males, aged 5-93 yr; mean age 44 yr). Five hr before the x-ray examination, patients received an i.v. injection of 2 mg glucagon and 5 mg diazepam and a 4 liter enema which they held for 20-30 min while changing their position from left lateral decubitus to prone and then to right lateral decubitus. To evacuate any remaining water from the rectosigmoid, Normacol powder was administered 1 hr before the examination. With the patient in the left lateral decubitus, 250-300 ml of contrast medium (density 1.600) were administered, followed by gradual insufflation, with the patient in a prone position, until the contrast medium reached the cecum. The colon was then completely insufflated while the patient was rotated 2-3 times, and the x-ray examination was completed in an average of 10-15 min. The use of glucagon made it possible to obtain excellent double contrast patterns of the mucosa and to opacify the distal ileum. In all but 4 or 5 cases, the patients, including those with Crohn's disease of the colon and ulcerative colitis, tolerated the enema well. Although the enema was not properly administered in 12 cases, the examination had to be performed again in only 3. By means of double-contrast radiography, 24 organic lesions of the colon and terminal ileum were demonstrated. Of 10 patients with diverticula of the colon, 4 had isolated diverticula in the right colon, a finding which has not been reported before.

2863 MEASUREMENT OF CIRCULATING DESIALYLATED GLYCOPROTEINS AND CORRELATION WITH HEPATOCELLULAR DAMAGE. *(E.)* Marshall, J. S.; Green, A. M.; Pensky, J.; Williams, S.; Zinn, A.; Carlson, D. M. (Case West. Reserve Univ. Sch. Med., Cleveland, Ohio). *J. Clin. Invest.* 54:555-562, 1974.

The binding of human thyroxine-binding globulin to hepatic cell plasma membranes on desialylation was studied. The amount of [^{125}I]desialylated thyroxine-binding globulin (DTBG) bound to rat liver cell plasma membranes progressively increased on the addition of further desialylated glycoprotein, until a point at which the binding sites were apparently saturated. The results of inhibition assays in which purified unlabeled desialylated glycoprotein were preincubated with the membranes showed that unlabeled DTBG prevented the binding of approximately 90% of the [^{125}I]desialylated orosomucoid at a concentration of 2 μg/ml. Desialylated orosomucoid appeared to have a greater affinity than DTBG for the plasma membrane binding sites. Similarly, desialylated fetuin and desialylated ceruloplasmin bound less avidly than DTBG. In testing the serum from patients with a variety of illnesses, serum from patients with Laennec's cirrhosis, biliary cirrhosis, hepatic metastases, and alcoholism with a primary hepatoma demonstrated greatly increased inhibitory activity. However, four patients with jaundice secondary to common bile duct obstruction by tumor, one with ascites secondary to pancreatitis, another with abnormal liver function tests due to congestive heart failure, and two with markedly abnormal rheumatoid factor latex fixation tests had serum with inhibitory activity within the normal range. No simple correlation was found between serum inhibitory activity and levels of alkaline phosphatase, SGOT, total bilirubin, serum albumin, or serum globulin. Column chromatography on Sephadex G-200 of a sample of serum from a liver cirrhosis patient showed the expected reversal of albumin to globulin ration compared to normal serum. Results of this study indicate that the hormone transport protein, glycoprotein thyroxine-binding globulin, may now be added to the group of serum glycoproteins which, after desialylation, bind to liver cell membranes. As for the clinical importance of this inhibition assay, Laennec's cirrhosis, biliary cirrhosis, primary and metastatic liver carcinoma, and hepatitis appear to be associated with elevated levels of circulating desialylated glycoproteins. Patients with abnormal liver function tests due to congestive heart failure, pancreatitis, or extrinsic biliary tract obstruction had normal inhibitory activity.

2864 D-XYLOSE ABSORPTION TEST AND QUANTITATIVE IMMUNOGLOBIN DETERMINATION AS SELECTION CRITERIA FOR PERFORMING PERORAL ASPIRATION BIOPSIES OF THE SMALL INTESTINE. *(Ger.)* Tinschmann, P.; Bertholdt, F. (Pediatr. Clin., Univ. Dusseldorf, Germany). *Monatschr. Kinderheilk.* 122(7):575-577, 1974.

Peroral biopsies and xylose tests were performed on 60 children, aged 6 weeks to 4 yr, who were suspected of suffering from malabsorption. Total atrophy of the villi was found in 16 biopsies. The data were categorized as either concordant or discordant and were evaluated for (1) length of time between the 2 tests (with the xylose test always preceding the biopsy) and (2) length of diet therapy before the first test. When tests were performed 0 to 10 days apart, results agreed on 75%; for a period of 11 to 21 days, only 47% agreed. After 0 to 10 days of diet therapy, results agreed in 80%, while after diet therapy for 11 to 21 days, only 18% agreed. Agreement after 21 days of therapy increased again to 78%. This suggests that the absorption of the mucosa responds more quickly to treatment than do morphological changes in the mucosa. Immunoglobulin determinations, performed in 38 cases, showed that patients with mucosal atrophy had IgA levels significantly higher than normal. Results from the D-xylose test and biopsy agree if both are performed simultaneously before institution of therapy. Celiac disease can be diagnosed with a high degree of accuracy in patients with decreased D-xylose absorption and increased IgA levels.

2865 EVALUATION OF FOUR VARIANTS OF THE INDIRECT HEMAGGLUTINATION TEST FOR HUMAN HYDATIDOSIS. *(E.)* Varela-Diaz, V. M.; Lopez-Lemes, M. H.; Prezioso, U.; Coltorti, E. A.; Yarzabal, L. A. (Pan Am. Zoonoses Cent., Panam. Health Organ./World Health Organ., Buenos Aires, Argentina). *Am. J. Trop. Med. Hyg.* 24(2):304-311, 1975.

The comparative sensitivity and specificity of the tannic acid, glutaraldehyde, benzidine and formol indirect hemagglutination test (IHA) were evaluated in the immunodiagnosis of human hydatidosis. Using the same pool of hydatid cyst fluid, 74 hydatosis sera were examined by each of the four IHA techniques. When the criterion for IHA test positivity was based on the observation of hemagglutination titers of 1:32 and above, the comparitive sensitivity of the four tests was found to vary with the group of sera examined. The highest titer at which hemagglutination was observed in non-hydatid sera was 1:32 with tannic acid, 1:256 with glutaraldehyde, and 1:128 with benzidine and formol-treated cells. Both the sensetivity and non-specificity of each IHA test variant was higher when the positivity criterion was based on the detection of reactors than when only titers were considered. The low rate of nonspecific reactions and higher sensitivity of the tannic acid IHA test, based on a diagnostic titer for hydatidosis as positivity criterion, suggest that it is more effective than the glutaraldehyde and benzidine tests.

2866 PREOPERATIVE CYTOLOGICAL DIAGNOSIS OF GASTRIC LEIOMYOSARCOMA. A REPORT OF THREE CASES. *(E.)* Cabre-Fiol, V.; Vilardel, F.; Sala-Cladera, E.; Perez Mota, A. (Santa Cruz San Pablo Hosp., Barcelona, Spain). *Gastroenterology* 68(3): 563-566, 1975.

The cytological characteristics of three recent cases of gastric leiomyosarcoma in which the diagnostic cells were obtained by an endoscopic cytology technique are described. Previous radiological diagnoses were malignant ulcer in one case, probable benign ulcer in one case, and multiple benign tumors in the third case. The diagnostic cells were obtained by exfoliative cytology using a brushing technique under direct vision. Malignant cells, mostly spindle-shaped, were found isolated or forming small groups. The cells had very elongated, clear cytoplasm with no vacuoles. The nuclei were hypertrophic, ovoid, and sometimes rounded. Chromatin distribution in the nuclei was irregular and in some instances the nuclei appeared segmented. Occasionally, malignant cells contained several, small superimposed nuclei with thick nuclear membranes and prominent nucleoli. Some such cells resembled epidermoid tadpole cells, while others featured an extremely long, fiber-like cytoplasm. These cells were interspersed with large, undifferentiated malignant cells. Sheets of cells from the superficial columnar epithelium were found in all smears; many exhibited signs of chronic gastritis. In two cases, gastroscopic biopsies showed normal superficial epithelium, and in the third case, several biopsy specimens showed malignant tissue. The definitive histological diagnosis in all cases was gastric leiomyosarcoma. The superiority of cytology over biopsy in this group of tumors may be explained in part by the submucosal growth of leiomyosarcoma, which prevents adequate biopsies, and in part by the wider area of samples of abrasive techniques under direct vision.

2867 ULTRASONICALLY GUIDED PERCUTANEOUS FINE NEEDLE BIOPSY OF THE PANCREAS. *(E.)* Hancke, S.; Holm, G. G.; Koch, F. (Gentofte Hosp., Hellerup, Denmark). *Surg. Gynecol. Obstet.* 140(3): 361-364, 1975.

A new method for the preoperative demonstration of malignant conditions of the pancreas is presented and preliminary results using it reported. By ultrasonic scanning of the abdomen, cross-sectional views of the organs, including the pancreas, can be outlined on an oscilloscope screen; lesions may thereby be demonstrated providing they have a certain minimum size. When a lesion is outlined, a guided puncture can be performed with a special ultrasonic transducer; the needle will follow exactly the direction of the sound beam emitted from the transducer. The ultrasonic scanning is performed with the patient in the supine position. When the lesion is located, the optimal place for the puncture is marked on the skin. The depth of the lesion is read from the oscilloscope screen and is marked on the fine needle. Aspirations are performed according to the technique described by Franzen. Routinely, 4 to 6 punctures in various directions are performed through the same guide cannula. Between July 1973 and September 1974, ultrasonic investigation was performed in about 410 patients, of whom 80 were found to have pancreatic disease. In 36 patients with suspected pancreatic lesions, scanning demonstrated a solid mass lesion in the pancreas; 21 biopsied patients had carcinoma and four had chronic pancreatitis. In 17 of the carcinoma patients, tumor cells were aspirated; the cells were numerous and easily recognizable, fulfilling the cytologic criteria of malignant disease. Aspirations could not be adequately performed in three carcinoma patients and normal pancreatic cells were aspirated from a fourth. In the four patients with chronic pancreatitis, normal pancreatic cells were aspirated. There were no immediate complications due to fine needle biopsy. The combination of ultrasonic scanning and ultrasonically guided percutaneous fine needle aspiration is an important adjunct to the management of pancreatic lesions, although more investigation is needed regarding the diagnostic sensitivity of the scanning technique and the cytologic evaluation of the aspirates.

2868 DIAGNOSIS AND PROGNOSIS IN COLON CANCER BASED ON A PROFILE OF IMMUNE REACTIVITY. *(E.)* Lurie, B. B.; Bull, D. M.; Zamcheck, N.; Steward, A. M.; Helms, R. A. (Boston City Hosp., Mass.). *J. Natl. Cancer Inst.* 54(2):319-325, 1975.

An immunologic profile consisting of measurements of circulating carcinoembryonic antigen (CEA), tumor antigen-induced inhibition of mononuclear cell migration (IMM), and skin reactivity to purified protein derivative, streptokinase-streptodornase, and mumps was assessed in 16 patients (4 female) with colon cancer. Before surgery, 10 of 14 patients tested had elevated CEA levels, 12 of 12 showed positive IMM, and 10 of 11 failed to react to two or more recall skin-test antigens. Among seven patients whose tumor were limited to the bowel wall and presumably completely removed at surgery, CEA assays either remained negative or became negative during the first month after surgery. Elevated CEA levels later occurred in three patients, none of whom showed evidence of recurrent colon cancer. All seven patients showed negative IMM tests 2 or more months after surgery, and increased skin-test reactivity was seen in six patients 3 or more months after surgery. One patient with a negative reaction in all skin tests had rising CEA values. In nine patients whose tumor masses were not completely removed at surgery, all had elevated CEA levels within a short time after surgery, none showed tumor antigen-induced IMM, and six showed suppressed skin-test reactivity. CEA, IMM, and skin test results remained unchanged in three patients with nonmalignant lesions. Used separately, CEA, IMM, and skin reactivity to recall antigens have known limitations, but the combined use of all three improves diagnosis and prognosis in colon cancer patients.

2869 PAROTID SALIVA TEST COMPARED WITH PANCREOZYMIN-SECRETIN TEST IN DIAGNOSIS OF PANCREATIC DISORDERS. *(E.)* Kakizaki, G.; Saito, T.; Soeno, T.; Sasahara, M.; Ohizumi, T.; Kato, E.; Fujiwara, Y. (Akita Univ. Med Sch., Japan). *Tohoku J. Exp. Med.* 114(3):241-245, 1974.

The pancreozymin-secretin and the parotid saliva tests were compared with regard to their reliability as diagnostic tools for pancreatic disorders in 12 patients with pancreatic disorders and 10 with non-pancreatic disorders. Both tests gave fairly comparable results in the group of patients with pancreatic disorders. The parotid saliva test gave false negative results for 1 of 3 patients with cholecystolithiasis with satellite pancreatitis, whereas the pancreozymin-secretin gave negative results for all three patients. In one patient with cancer of the head of the pancreas the pancreozymin-secretin test gave more reliable results than the parotid saliva test. The parotid saliva test was negative in all patients with non-pancreatic disorders, while the pancreozymin-secretin gave false positive results in eight of 10 patients. Positive results of the pancreozymin-secretin test were 75% accurate and those of the parotid saliva test were 83.3% accurate in the 12 patients with pancreatic disease. In 10 patients with non-pancreatic disorders, the parotid saliva test was 100% accurate, while the pancreozymin-secretin test gave very high false positive results. As a whole, a positive parotid saliva test was 90.9% accurate in diagnosing pancreatic disorders, while a positive pancreozymin-secretin test was only 50% accurate. It is suggested that the parotid saliva test is a potentially useful test in predicting the presence or absence of pancreatic disorders regardless of the presence of abnormal biliary function or of duodenal disease.

2870 USE OF THE ENTEROTEST DUODENAL CAPSULE IN THE DIAGNOSIS OF GIARDIASIS. A PRELIMINARY STUDY. *(E.)* Thomas, G. E.; Goldsmid, J. M.; Wicks, A. C. B. (Dep. Med., Univ. Rhodesia, Salisbury). *S. Afr. Med. J.* 48(53):2219-2220, 1974.

The Enterotest capsule was compared with stool examination and jejunal aspirate as a method for finding *Giardia lamblia* in patients under investigation for malabsorption as a cause of megaloblastic anemia. The Enterotest consists of a gelatin pharmaceutical capsule lined with silicone rubber in which is embedded a 1 g spherical lead weight. Packed inside the capsule is 140 cm of thread and 3-ply white nylon yarn with the free end protruding through a hole in one end of the capsule. When the capsule is swallowed, the free end of the yarn is attached to the patient's mouth. The gelatin dissolves in the stomach leaving a small lead-weighted rubber bag which passes through the pylorus. When the yarn is withdrawn, it leaves the rubber bag to pass in the stool. The mucus which adheres to the yarn is scraped off and examined microscopically for parasites. The Enterotest was positive 5 of 6 times and the jejunal aspirate from the Crosby capsule 4 of 7 times. The first stool was positive twice and the second stool twice; in two patients three consecutive stools were negative. It is concluded that the Enterotest is a safe and effective technique for screening patients for upper gastrointestinal parasites and appears to be more useful than stool and biopsy examination.

2871 RADIOMANOMETRY IN THE DIAGNOSIS OF COMMON BILE DUCT DISEASE. *(E.)* Mieny, C. J.;

Mendelow, D.; Cooke, P. (J. G. Strydom Hosp., Johannesburg, South Africa). *S. Afr. J. Surg.* 12(4): 189-191, 1974.

Pressure and flow measurements were made during biliary surgery in 44 cases. An 8 F.g. feeding tube was inserted through the cystic duct into the common duct and a standard cholangiogram was performed. The barrel of a 20 ml disposable syringe was then connected to the tube and filled with saline. The barrel was raised beside a vertical ruler and opening pressure recorded when the level began to drop. Flow rate per min was recorded at opening pressure and at 30 cm. In 28 cases presenting with stones in the gallbladder but normal common ducts, opening pressure was 14 cm saline, and flow rate 25 ml/min at 30 cm. In 12 cases with stones in the common duct, opening pressure was 28 cm, and flow rate 14 ml/min. In four miscellaneous cases (two pancreatitis, one common bile duct carcinoma, one dilated common bile duct) opening pressure was 23 cm and flow rate 13 ml/min. It is concluded that when opening pressure is over 20 cm, exploration of the common bile duct is indicated.

2872 SEPTIC COMPLICATIONS FOLLOWING ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY. *(E.)* Davis, J. L.; Milligan, F. D.; Cameron, J. L. (John Hopkins Med. Inst., Baltimore, Md.). *Surg. Gynecol. Obstet.* 140(3):365-367, 1975.

Four cases of septic complications resulting from retrograde cholangiography and pancreatography are presented. In each case, pyrexia and usually abdominal pain appeared within 48 hr after the procedure. Stasis was present in each of the cases, but was unlikely in itself to have been sufficient cause. Infection may have been due to cannulation by introduction of bacteria, or by dissemination of already contaminated bile. In each case immediate surgery was performed, and recovery was successful in all but one patient, who had diffuse metastatic carcinoma of the liver. It is suggested that early operative intervention be planned for any patient in whom the procedure demonstrates stasis. The abdomen should be x-rayed 12-24 hr after the procedure to check for retained contrast media. Any patient developing abdominal pain and fever not responsive to antibiotics, fluid therapy or nasogastric suction should undergo immediate laparotomy. Finally, it is suggested that all patients undergoing this procedure be given antibiotic treatment.

2873 ANGIOGRAPHY OF GALLBLADDER CANCER. *(E.)* Kido, C.; Hibino, K.; Kaneko, M.; Sasaki, T. (Aichi Cancer Cent. Hosp., Japan). *Nippon Acta Radiol.* 34(1):1-11, 1974.

Selective angiography was evaluated in the diagnosis of gallbladder cancer. Twenty-five cases presenting with either a palpable tumor in the right hypochondrium, or jaundice, or both were studied. The cystic artery showed vasodilation in 17 cases (68%), hypervascularity in 20 cases (80%), and tumor-stain in 16 cases (64%). These blood vessels showed luminal irregularity and stiffening in 64%, displacement or interruption due to gallbladder swelling in 32%, slight displacement to the left of the gastroduodenal artery in 44% and stenosis or interruption of the gastroduodenal artery or proliferation of minute blood vessels in 12%. On histological examination, adenocarcinoma was found in 17 cases, papillary adenocarcinoma in two, anaplastic carcinoma in four, and mucoepidermoid and leiomyosarcoma in one case each. Liver metastasis was angiographically observed in 12, and liver cirrhosis in four cases. Gallbladder cancer was successfully diagnosed by angiography in 18 of 25 cases (72%). It is concluded that angiography provides a high rate of successful diagnosis, and is superior to other methods previously employed.

2874 THE BUDD-CHIARI SYNDROME: CORRELATION BETWEEN HEPATIC SCINTIGRAPHY AND THE CLINICAL, RADIOLOGICAL, AND PATHOLOGICAL FINDINGS IN NINETEEN CASES OF HEPATIC VENOUS OUTFLOW OBSTRUCTION. *(E.)* Tavill, A. S.; Wood, E. J.; Kreel, L.; Jones, E. A.; Gregory, M.; Sherlock, S. (R. Free Hosp., London, England). *Gastroenterology* 68(3): 509-518, 1975.

Between 1965 and 1972, 19 patients (12 female) with proven hepatic venous outflow obstruction were studied and the abnormalities observed on hepatic scintigraphy correlated with those seen on vascular radiology. In 10 cases, hepatic venous occlusion was secondary to other disorders, the most common being polycythemia rubra; in the remaining nine patients, no underlying cause for the hepatic venous occlusion was found. Serum albumin was reduced below normal levels in 12 patients, serum bilirubin was raised in 16 patients, and serum alkaline phosphatase was frequently raised although seldom excessively. Liver biopsies showed varying degrees of venous congestion, hemorrhage, and necrosis. In 15 patients, hepatic scintigraphy showed central localization of radiocolloid, this being the predominant feature in seven patients; normally, the maximum uptake is to the right of the midline. The inferior vena cava showed some degree of narrowing or distortion in its intrahepatic course in 13 patients, was occluded in three, and appeared normal in two. All but one patient showed a raised inferior vena cava pressure. Presumptive evidence of complete occlusion of the main hepatic veins was found in five patients; in nine others, a variety of venographic findings were demonstrated. Celiac axis arteriography showed stretching, arching, and attenuation in the intrahepatic arteries. Seventeen patients deteriorated progressively, the period between onset of symptoms and death ranging from 6 weeks to 3.5 yr. Ascites was a major problem in all but one patient. In six cases, autopsy revealed disproportionate enlargement of the caudate lobe, and in seven, the main hepatic veins were occluded by fibrous stenosis or organized thrombus. Additional studies indicated that the separate venous drainage of the caudate lobe may be preserved when the main hepatic veins are occluded and that hypertrophy of the caudate lobe occurs because of its relatively more efficient perfusion. Demonstration of the enlarged caudate lobe by scintiscanning and inferior vena cavography provides valuable diagnostic support for the Budd-Chiari syndrome.

2875 SERUM FERRITIN IN PATIENTS WITH IRON OVERLOAD AND WITH ACUTE AND CHRONIC LIVER DISEASES. *(E.)* Prieto, J.; Barry, M.; Sherlock, S. (R. Free Hosp., London, England). *Gastroenterology* 68(3):525-533, 1975.

Serum ferritin concentrations in patients with acute and chronic liver disease were studied by immunoradiometric assay, and the test was evaluated as a measure of storage iron. Included were 11 patients with idiopathic hemochromatosis, one hematologically normal subject who had received iron-dextran i.m. over a 2-yr period, 20 patients with iron overload from hematological disease, 13 patients with acute non-alcoholic liver disease, 24 patients with alcoholic liver disease, 19 patients with cryptogenic cirrhosis, 11 with primary biliary cirrhosis, 28 normal controls, and five with chronic simple iron deficiency anemia. Serum ferritin showed a significant correlation with liver iron concentration in idiopathic hemochromatosis and in iron overload from hematological disease. In six patients with untreated hemochromatosis, serum ferritin levels of 1290-8300 μg/liter were found. In two of three patients with idiopathic hemochromatosis, the serum ferritin fell during phlebotomy therapy in an inverse exponential relationship with the cumulative amount of storage iron removed, but the rate of fall increased toward the end of the treatment as the ferritin levels became normal and sub-normal. In all three, liver iron concentration was high; hemosiderin granules were present in the portal tract and perilobular fibrous tissue, but only trace amounts of iron were found intracellularly. Ferritin levels were high in patients with acute and chronic liver disease, the highest values (over 27,600 μg/liter) in patients with viral and drug-induced hepatic necrosis. Although high ferritin levels were associated with severe or active hepatocellular disease, regardless of etiology, not all patients with increased transaminase values had high ferritin. Women and patients with recent hemorrhage tended to have lower ferritin levels. In patients with hepatocellular disease of rapidly changing activity, serum transaminase level changes were accompanied by proportional changes in serum ferritin. There was also a significant correlation between serum ferritin and aspartate transaminase in 63 patients, but this disappeared when the patients with ferritin levels above 1200 μg/liter were omitted. It is concluded that the ferritinemia of liver disease may be largely derived from damaged hepatocytes, and that serum ferritin measurement is an ideal way of monitoring the progress of idiopathic hemochromatosis patients during treatment.

2876 AMYLASE CLEARANCE IN DIFFERENTIATING ACUTE PANCREATITIS FROM PEPTIC ULCER WITH HYPERAMYLASEMIA. *(E.)* Warshaw, A. L.; Lesser, P. B. (Massachusetts Gen. Hosp., Boston). *Ann. Surg.* 181(3):314-316, 1975.

Patients (34) with abdominal pain, tenderness, and hyperamylasemia suggestive of acute pancreatitis were studied prospectively to elucidate the relationship between peptic ulcer disease and pancreatitis. The admitting diagnosis in each case was pancreatitis. The first group of 25 patients had a protracted course of illness consistent with acute pancreatitis as well as evidence of pancreatitis either on upper gastrointestinal series or at surgery. Seven patients (Group II) had rapid resolution of pain and had no evidence of pancreatic inflammation rather than high serum amylase and epigastric tenderness. The diagnosis of nonperforated peptic ulcer disease without concomitant pancreatitis was made both radiologically and at surgery in four patients and by upper gastrointestinal series alone in three. Two patients (Group III) had duodenal ulcers demonstrated by upper gastrointestinal series and signs of pancreatic swelling and inflammation. All patients had significantly elevated serum amylase, and the three diagnostic groups did not differ in urinary amylase, serum lipase, serum calcium, or white blood count. The amylase:creatinine clearance ratio was 3-fold higher than normal in the first and third groups, but normal in the second; there was very little overlap of the ranges for patients with and without pancreatitis. The amylase:creatinine clearance ratio is therefore useful for confirming or questioning the diagnosis of acute pancreatitis. Patients with normal clearance ratio should be evaluated immediately for other conditions which cause hyperamylasemia, including gastric or duodenal ulcer.

2877 REAPPRAISAL OF ENDOSCOPIC TISSUE DIAGNOSIS IN SECONDARY GASTRIC LYMPHOMA. *(E.)* Posner, G.; Lightdale, C. J.; Cooper, M.; Sherlock, P.; Winawer, S. J. (Mem. Sloan-Kettering Cancer Cent., New York, N.Y.). *Gastrointest. Endosc.* 21 (3):123-125, 1975.

A reappraisal of the ability of endoscopy to document the presence of gastric involvement in disseminated lymphoma is presented. Charts of 14 patients (seven female) with proven gastric lymphoma who had been endoscoped were reviewed. The reasons for endoscopy included upper gastrointestinal bleeding, abdominal mass, abdominal pain, and evaluation of the extent of disease in patients previously diagnosed . Ten of the patients had tissue diagnosis made at endoscopy, and in four patients, attempts to make an endoscopic diagnosis failed. In all patients a malignant neoplasm of unknown type was diagnosed by endoscopic visualization. Large, thickened folds were seen in 10 patients, and the folds appeared nodular in three additional patients. In one patient with reticulum cell sarcoma, there was rigidity and a malignant-appearing ulcer, and in one patient with Hodgkin's disease there was an ulcerated mass. Endoscopic cytological washings did not add to biopsy and directed brush cytology in obtaining malignant tissue. The results indicate that with current endoscopes and directed biopsy and cytology techniques, there is a good likelihood of obtaining a tissue diagnosis in gastric lymphoma. In cases where gastric lymphoma is suspected, an aggressive attempt to confirm the diagnosis using these techniques is suggested.

2878 COMPARISON OF GASTRIC SECRETION STIMULATED BY HISTAMINE IN CONTINUOUS INFUSION AND IN A SINGLE SUBCUTANEOUS DOSE. *(Sp.)* Chahud, I. A.; Zegarra, A. C.; Bouroncle, C. J. M. (Hipolito Unanue Hosp., Lima, Peru). *Rev. Esp. Enferm. Apar. Dig.* 44(2):131-140, 1974.

A comparison was made between the augmented histamine test and the histamine infusion test in 16 patients. For the augmented histamine test, basal values for volume, acidity, and acid output were measured every 15 min for 1 hr. Patients received 10 mg of chlorpheniramine maleate i.m. 30 min before a single s.c. injection of 0.04 mg/kg histamine phosphate. The histamine infusion test, performed 48 hr later, consisted of slow i.v. infusion of 0.04 mg/kg. histamine and measurement of volume, acidity, and acid output after basal values had been obtained. In the histamine infusion test, values for volume and acidity were higher and remained almost constant at a high level, while in the augmented histamine test these values increased within 15 min after administration of histamine and then, 45 min after injection, began to decrease. Better values for maximum acid output were also obtained with the histamine infusion test. Values of 18.757 and 18.757 mEq/hr were obtained for the 1st and 2nd hr after histamine infusion, in comparison to 14.031 and 10.031 mEq/hr, resp., obtained with the augmented histamine test. The difference between these results was significant, as was that for 15 min fractions. The side effects of histamine were less severe and less disagreeable when histamine was infused rather than injected s.c. The histamine infusion test is recommended for patients with hypochlorhydria and for evaluating the results of vagotomy.

2879 DOUBLE CONTRAST EXAMINATION OF THE STOMACH AS A PART OF ROUTINE DIAGNOSIS. *(Ger.)* Tschaikowski, K. L. (no affil.). *Leber Magen Darm* 4(4):158-164, 1974.

A technique has been developed by which double-contrast x-rays of the stomach can be obtained without insufflating the stomach with air. The patient is given hexocyclium methyl sulfate the evening before the examination to reduce gastric secretion and N-butylscopolammonium bromide s.c. 15 min before to reduce gastric motility and muscle tonus. The patient then receives 100 ml of contrast medium (Unibaryt C) to which a teaspoon of a special emulsion has been added to prevent gas bubbles and improve adhesiveness of the contrast medium. Paspertin (25 drops) is also added. The concentration of Unibaryt C should be higher than that recommended on the package. It is recommended that 3.4 parts of contrast medium be used to 1 part water. After this, the patient drinks an effervescent powder (tartaric acid and sodium bicarbonate, 1:1). After 3-5 min, the patient is positioned on his left side with his head lowered. If the stomach contains much fasting secretion or is very relaxed, 50-100 ml of normal contrast medium are administered. X-rays are then taken as with the double contrast method. The relief of the gastric mucosa shows up best when 70-90 kV are used.

2880 VALUE OF ARTERIOGRAPHY IN THE DIAGNOSIS OF CANCER OF THE GALL BLADDER. *(Fr.)* Coulomb, M.; Marty, F.; Baudin, P.; Aguettaz, G.; Geindre, M. (Univ. Hosp. Cent. Grenoble, France). *Ann. Radiol. (Paris)* 17(5):497-505, 1974.

The technique of celiac-mesenteric arteriography was evaluated in the diagnosis of 4 patients with gallbladder cancer. In three cases, arteriography supported the diagnosis of cancer of the gall bladder, while laparoscopy produced a conclusive diagnosis in only one case. In one case, a definitive diagnosis of gallbladder cancer was only made on operation, although reexamination of the arteriographic evidence after the fact showed clear signs of a malignant gallbladder tumor. Arteriographic evidence for gallbladder cancer included dilation of the cystic artery (in three of the four cases); parietal invasion or amputation of the cystic branches (in three cases); anarchic neovascularization (three); tumorography (four cases); abnormal venous return (two); signs of hepatic invasion (four cases); and loco-regional extension into the duodenopancreas, colon and venous portal system (one case). In this series, surgery was contraindicated in two cases. Contraindications included massive hepatic invasion, duodenopancreatic extension, and complete obstruction of the portal vein. The extent of the lesions and the feasibility of surgery can thus be assessed by means of angiography.

2881 RADIOLOGICAL SIGNS OF ILEOCOLIC INVAGINATIONS IN ADULTS: THIRTEEN CASES. *(Fr.)* Bret, P.; Piante, M.; Tran Minh, V.; Deliot, J. F. (Edouard-Herriot Hosp., Lyon, France). *Ann. Radiol. (Paris)* 17(5):471-477, 1974.

Ileocolic invagination was observed in 13 patients, aged 51-81 yr. The patients had presented with digestive hemorrhage, difficulty in intestinal transit, and pain. There were seven instances of cancer, including four epitheliomas and three sarcomas; four cases of benign tumors, including one adenoma and three lipomas; and two cases requiring no surgical intervention which appeared from the radiological evidence to be benign. Interpretation of the radiological evidence is facilitated when the obstruction is not complete. The picture of ileocolic invagination is characterized by segmentary enlargement of the caliber of the colon, absence of fill-in of the dilated segment accompanied by a lacunary image, and specific characteristics of the lacunary image. Diagnosis of the benign or malignant nature of the tumor was possible radiologically in 2/3 of the cases. When the radiological evidence of a barium enema does not suffice, an intestinal transit should resolve doubts by identifying a slowing of the duration of transit in cases of intestinal stenosis; ascension of the ileocecal region; migration and infundibular aspect of the section; and generally satisfactory impregnation of this section contrasting with the lacunary image.

2882 PANCREATITIS: THE PANCREATOGRAM AND EXOCRINE PANCREATIC FUNCTION. *(Ger.)* Loffler, A.; Stadelmann, O.; Wobser, E.; Miederer, S. E. (Med. Polyclin., Univ. Bonn, Germany). *Leber Magen Darm* 4(5):195-200, 1974.

Endoscopic retrograde pancreatography and the secretin-pancreozymin test were performed on 46 patients who were recovering from acute or acute recurrent pancreatitis or who had clinically diagnosed pancreatitis or pancreatic calcification. Radiological findings were grouped into four stages: (0) no pathological changes; (1) circumscribed dilatations of the duct, isolated stenosis, and/or circumscribed or generalized parenchymal opacification which, in some cases, was associated with small cysts; (2) moderate dilatation of the entire main duct, isolated stenosis, and dilatation of accessory ducts; and (3) massive dilatation and stenosis of the entire duct system. Cysts were found in all stages. Results of the secretin-pancreozymin test were also grouped into four stages (0) normal findings; (1) normal bicarbonate values with decreases in one or more of the enzymes measured (amylase, trypsin, and chymotrypsin); (2) decreased bicarbonate values with normal enzyme levels or decreases in one or nore enzymes; and (3) maximum bicarbonate concentrations below the 3-σ limit with decreases in one or more enzyme. The results of these two tests agreed in 11 of the 23 patients (48%) with stage 0 findings in either the radiological or secretion test; in three of the 18 patients (17%) with stage 1 findings; and in only one of the 10 patients (10%) with stage 2 findings. However, the results of the two tests agreed in 11 of the 15 patients (73%) with stage 3 findings. Of the 19 patients with stage 1 or 2 radiological findings, 10 had normal pancreatic function, while only two patients with normal radiological findings had abnormal pancreatic function. In 15 cases the radiological findings were more abnormal than results of the pancreatic function test, but pancreatic function was more abnormal than radiological findings in only five cases. Therefore, in the early stages of chronic pancreatitis, endoscopic retrograde pancreatography is of more diagnostic value than the secretin-pancreozymin test.

2883 THE DIAGNOSIS OF PANCREATIC FUNCTION WITH THE ^{75}SELENOTHIONINE TEST. *(Ger.)* Dressler, J.; Hor, G.; Butterman, G.; Pabst, H. W. (Clin. Nucl. Med., Tech. Univ., Munich, Germany). *Munch. Med. Wochenschr.* 117(7):237-240, 1975.

After injection of ^{75}Se-methionine (0.3 μCi/kg i.v.) and pancreatic stimulation with 1 IU/kg secretin and 1 IU/kg pancreozymin, the activity of ^{75}Se-methionine and pancreatic secretion were studied in 5 samples of duodenal juice collected at 20 min intervals from 50 patients, 44 of whom had clinical signs of pancreatic disease. The concentrations and total quantities of amylase and trypsin were measured in the duodenal juice along with its volume, pH, and bicarbonate content. A significant correlation between ^{75}Se-methionine radioactivity and trypsin output was found in all fractions of duodenal juice but the first. The correlation between ^{75}Se-methionine and amylase was not as close. In these 50 patients, the results of the ^{75}Se-methionine test agreed with the clinically established diagnosis in 40 cases. False-positive and false-negative results were obtained in 2 cases each. Therefore, the ^{75}Se-methionine test can be used to study exocrine pancreatic function in place of enzymatic methods. By using pancreatic scintigraphy with the ^{75} Se-methionine test, information can be obtained about the morphology and function of the pancreas.

2884 X-RAY EXAMINATION OF THE GASTROINTESTINAL TRACT WITH A NEW BARIUM CONTRAST MEDIUM. *(Ger.)* Stallmann, K. (Lennep Hosp., Remscheid, Germany). *Leber Magen Darm* 4(4):164-166, 1974.

Barium sulfate Fertig Suspension (C. H. Boehringer & Son Co.) is a contrast medium with a low viscosity and high barium sulfate concentration which also contains dissolved carbon dioxide. For a stomach examination, 150-200 ml are usually required and for a contrast enema, 300-600 ml. This new contrast medium was used to perform x-ray examinations on 178 patients. The examinations consisted of 121 of the stomach and duodenum, 35 of the esophagus, 12 of the small intestine, and 10 of the colon. In most cases, exposures of the esophagus, stomach, and duodenum were taken in several planes with the patient's head lowered. Additional injection of a spasmolytic (40-80 mg of N-butylscopolammonium bromide) facilitates visualization of a hiatus hernia or esophageal varices. If the patient is positioned correctly, the contours of the gastric mucosa are visualized as they are by the double-contrast method. It is also possible to perform hypotonic duodenography with this contrast medium. The contrast medium reached the cecum after 1.5 hr at the most so that a complete diagnosis of the small intestine can be obtained routinely in a reasonable length of time. The carbon dioxide in the contrast medium eliminated the necessity of insufflating the colon with air to obtain double-contrast exposures.

2885 ECHOTOMOGRAPHIC AND ARTERIOGRAPHIC FINDINGS IN ACUTE HEMORRHAGIC PANCREATITIS: REPORT

OF ONE CASE. *(Fr.)* Gillet, M.; Combe, J.; Aubert, D.; Weill, F.; Ricatte, J. P.; Runser, C. (Univ. Hosp. Cent., Besancon, France). *Chirurgie* 99(10):727-733, 1973.

A 58-yr-old man with a 5 yr history of severe hypertension discontinued therapy (low-sodium diet, altizide, hydergine) and was hospitalized with a series of cerebrovascular accidents, renal failure, and increased serum amylase levels suggestive of acute pancreatitis. He spontaneously developed a huge abdominal mass and a large lumbar hematoma on the right in the absence of local injections or any abdominal trauma. By this time serum amylase activity had normalized, but serum lipase activity increased. Celiomesenteric arteriography revealed unusual vascular abnormalities which included irregular stenosis, segmental thrombosis, and leakage of the contrast medium, suggestive of a malignant lesion, probably an epithelioma or sarcoma, in the head of the pancreas. Echotomography initially revealed the presence of a pseudotumor in the head and neck of the pancreas, but a follow-up examination showed active necrosis. At surgery a hematoma the size of an orange was found in the root of the mesentery; this hemorrhagic mass involved the uncinate process of the pancreas and communicated with a larger, submesocolic mass which involved all but 3 cm of the tail of the pancreas. A subtotal, intracapsular sequestrectomy was performed with drains being placed in the stomach and gallbladder. Postoperatively, the patient's lipase levels returned to normal after 4 days, but severe renal failure persisted and an external pancreatic fistula developed. Although the fistula healed after a month, rapid increases in blood nitrogen and potassium necessitated many sessions of renal dialysis, and the patient died suddenly, 42 days after surgery, of massive gastrointestinal bleeding. In this patient, selective arteriography demonstrated the vascular origin of the pancreatitis: the intrapancreatic hematoma accounted for shunts from the superior mesenteric and gastroduodenal arteries; stenosis was caused by extrinsic compression of the Riolan's arcade; and pools of blood were probably associated with vascular erosions. Echotomography is considered superior to selective arteriography for the diagnosis of acute pancreatic necrosis since it is safer and easier to perform, can be repeated several times on consecutive days without discomfort, and is the only paraclinical examination which gives objective information about the evolution of pancreatic necrosis.

2886 ANGIOGRAPHY IN DIAGNOSIS OF SMALL BOWEL TUMORS. *(E.)* de Schepper, A.; Hubens, A.; van Vooren, W.; Verbraeken, H. (Dep. Radiol., Univ. Instelling, Antwerp, Belgium). *Radiologe* 14(9):425-430, 1974.

The findings of selective angiography of the visceral arteries in previous investigations of gastrointestinal hemorrhage have been tabulated and placed into 8 major groups: 1) arteries supplying the tumor are dilated and more rapidly filled than adjacent arteries; 2) rich vascularization with an enlarged number of arterioles, but regular in size and course, and early filling of the arteriolar network; 3) irregular, moniliform aspect of the arterioles; 4) infiltration, encasement and abrupt ending of the arteries and arterioles; 5) intensified tumor opacification in the capillary-parenchymatous phase, homogeneous contrast stain, dense but with well defined borders, sometimes with a ringlike appearence; 6) irregular pooling of contrast, along with a mottled or heterogeneous pattern of the tumor; 7) intratumoral filling defect due to necrosis, with or without central contrast extravasation; and 8) early and massive venous drainage with or without dilatation of the efferent veins. It is noted that angiographic findings often overlap. Thus, a predominance of groups 2 and 5 signs were noted in benign tumors; a predominance of symptoms 2 and 3, in malignant tumors. Groups 1 and 8 signs have been found to represent predominantly benign cases. It is concluded that, in the event conventional radiology fails, angiography may discover a tumor and provide information regarding localization and extent. To a lesser degree, it may also give an indication as to the nature of the lesion. Angiography may be used to confirm the diagnosis in cases of known or suspected tumor. In using angiography one must remember the ill-defined signs of some tumors and the lack of definite criteria to differentiate benign and malignant lesions. The angiographic information concerning localization, size, extent and sometimes nature of the small bowel tumor is, however, of extreme value in the preoperative screening of patients with gastrointestinal bleeding.

2887 GASTROINTESTINAL FIBER ENDOSCOPY: ADVANCES, LIMITATIONS, AND RISKS. *(Fr.)* Gaucher, A. (no affil.). *Rev. Fr. Gastroenterol.* (100): 5-12, 1974.

2888 THE UTILIZATION OF CRYSTALLINE PANCREATIC GLUCAGON IN ENDOSCOPIC AND ROENTGENOLOGICAL EXAMINATIONS OF THE INTESTINAL TRACT. *(Ger.)* Paul, F.; Freyschmidt, J. (Med. Coll., Hannover, Germany). *Z. Gastroenterol.* 12(8):614-615, 1974.

2889 AN ENDOSCOPIC METHOD FOR RECORDING DC POTENTIALS IN THE UPPER GASTROINTESTINAL TRACT. *(E.)* Goodman, E. N.; Sandler, B. T.; Sullivan, M. R. (Coll. Physicians Surg., Columbia Univ., New York, N.Y.). *Am. J. Gastroenterol.* 63(1):13-19, 1975.

2890 THE VALUE OF FIBER ENDOSCOPY IN UPPER GASTROINTESTINAL BLEEDING. *(Fr.)* Ribet, A. (no affil.). *Rev. Fr. Gastroenterol.* (100):29, 1974.

2891 ENDOSCOPY IN UPPER GASTROINTESTINAL BLEEDING: EXPERIENCE IN 72 CASES. *(Fl.)* Geboes, K.; Broeckaert, L.; Hellemans, J. (St. Rafael Univ. Hosp., Brussels, Belgium). *Tijdschr. Gastroenterol.* 17(2):129-137, 1974.

2892 ESOPHAGEAL VARICES: ACCURACY OF ENDOSCOPIC AND RADIOLOGICAL DIAGNOSIS. *(Ger.)* Kapp, F.; Faust, H. (Canton. Hosp., Basel, Switzerland). *Z. Gastroenterol.* 12(8):682-629, 1974.

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2967 THE USE AND VALUE OF RADIOLOGICAL EXAMINATIONS TO DIAGNOSE PANCREATIC DISEASE. *(Ger.)* Moldenhauer, W. (Radiol. Clin., Univ. Rostock, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 34(2-4): 185-189, 1974.

See also, 2968, 3028, 3033, 3066, 3114, 3290, 3296, 3362, 3399, 3435, 3506, 3575, 3581, 3582, 3654, 3781.

GASTROINTESTINAL DISEASES

ESOPHAGUS

2968 OESOPHAGOSCOPY, BIOPSY, AND ACID PERFUSION TEST IN DIAGNOSIS OF 'REFLUX OESOPHAGITIS'. *(E.)* Sladen, G. E.; Riddell, R. H.; Willoughby, J. M. T. (St. Bartholomew's Hosp., London, England). *Br. Med. J.* 1(5949):71-76, 1975.

Endoscopic assessment of 71 patients with possible reflux esophagitis was compared with radiological findings, esophageal biopsy studies, and acid perfusion tests. All patients had chronic continuous or intermittent esophageal symptoms, some typical and some atypical for reflux esophagitis. Typical symptoms included pain or discomfort in the retrosternal area associated with either relationship to posture, aggravation by swallowing, and relief by antacids. Atypical symptoms included retrosternal pain or discomfort unaccompanied by any of the above features, pain in the epigastrium or abdomen, regurgitation or flatulence with no discomfort, upper gastrointestinal blood loss, or isolated dysphagia. Routine radiography showed no abnormality other than sliding hiatus hernia in 46, 20 of whom showed evidence of reflux. The entire esophagus was examined by endoscopy; evidence of esophagitis was based solely on the presence of mucosal friability. Biopsy specimens from macroscopically abnormal areas in 36 patients, or from random points in the distal 10 cm were assessed without knowledge of the symptoms or endoscopic findings. Acid perfusion tests were also performed in 48 patients. Endoscopic results showed the patients with typical symptoms had a higher incidence of endoscopic abnormality than those with atypical symptoms, and had a significantly higher incidence of radiologically demonstrable reflux. True reflux esophagitis was present in 1/3 of these. The histological studies showed a greater incidence of abnormality in patients with typical symptoms, but this was not statistically significant. The acid perfusion test results were positive in most patients (14) with typical symptoms, and only five with atypical symptoms. Statistically significant correlations were also found between the acid perfusion test and endoscopic abnormality. It is concluded that the acid perfusion test is useful in the diagnosis of atypical reflux symptoms, but endoscopy and biopsy should be limited for the few patients with special problems or for clarification of a radiological lesion.

2969 THE ASSOCIATION OF CARCINOMA OF THE ESOPHAGUS WITH ACHALASIA. *(E.)* Hankins, J. R.; McLaughlin, J. S. (Univ. Maryland Sch. Med., Baltimore). *J. Thorac. Cardiovasc. Surg.* 69(3):355-360, 1975.

Two case reports are presented of esophageal carcinoma found among 156 achalasia patients over a 13 yr period. The patients were a 33-yr-old black male who presented with dysphagia complicated by hematemesis and melena, and a 60-yr-old white male who presented with dysphagia of 10-15 yr duration and a 4-5 month history of epigastric pain, nausea, regurgitation, hematemesis, and melena. Squamous cell carcinoma was found at biopsy in both cases in addition to achalasia diagnosed by esophagograms. A review of the literature indicated a carcinoma incidence in achalasia of 1-7.7% in clinically diagnosed cases, and 20-29% when found at autopsy. Analysis of 78 cases since 1970 showed achalasia symptoms are present an average of 20 yr before carcinoma is diagnosed. The average age at diagnosis was 48-52 yr. The ratio of men to women was 2.8:1 despite greater frequency of achalasia in women. Treatment was the same as for carcinoma without achalasia, including esophagogastrectomy and radiation therapy; however, prognosis was worse. Of the 2 cases presented here, the 1st developed a recurrence after surgery and the patient died shortly after a 2nd operation. The 2nd patient developed a pyloric spasm 5 months after surgery, and a possible lymph node metastasis. It is emphasized that more attention be directed to prevention and early detection of this condition.

2970 THE ESOPHAGUS: ANATOMICAL, FUNCTIONAL, RADIOLOGICAL AND CLINICAL STUDY. DEGLUTITION. I. PHYSIOLOGY. *(Fr.)* Nemours-Auguste, S.; Barag, N. (Paul-Brousse Hosp., Villejuif, France). *Ouest Med.* 26(3):201-252, 1973.

2971 THE ESOPHAGUS: ANATOMICAL, FUNCTIONAL, RADIOLOGICAL AND CLINICAL STUDY. DEGLUTITION. I. PHYSIOLOGY (CONTINUATION). *(Fr.)* Nemours-Auguste, S.; Barag, N. (Paul-Brousse Hosp., Villejuif, France). *Ouest Med.* 26(4):357-398, 1973.

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ESOPHAGUS

2996 HYPERCALCEMIA ASSOCIATED WITH ESOPHAGEAL CARCINOMA IN THE ABSENCE OF BONE METASTASIS. *(E.)* Chandrasekhara, R.; Pilz, C. G.; Levitan, R. (VA West Side Hosp., Chicago, Ill.). *Am. J. Dig. Dis.* 20(2):173-175, 1975.

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See also, 2892, 2893, 2943, 2959, 3081, 3198, 3551, 3689, 3694, 3734.

STOMACH

3008 ALCOHOL INJURY TO GASTRIC MUCOSA IN MICE AND ITS POTENTIATION BY STRESS. *(E.)* Kawashima, K.; Glass, G. B. J. (New York Med. Coll., N.Y.). *Am. J. Dig. Dis.* 20(2):162-172, 1975.

The role of alcohol in gastric mucosal injury, with and without stress, was studied in 423 Swiss-Webster mice. All mice were fasted 6 hr prior to and 3 hr after ethanol administration. Ethanol with water was administered by esophageal intubation to 204 mice in 4 concentrations (10%, 25%, 35%, or 50% vol/vol) and in 5 doses (1, 2, 3, 4, or 5 g/kg). Each group was studied after 6, 24, and 72 hr. In 45 mice, several doses were given over 3-5 consecutive days. In the remaining 120 mice, the effect of stress (1 hr restraint in a narrow tube at 8 C) was studied in combination with the ethanol. Of these, 48 were given ethanol prior to the stress, and the other 48 after stress. In half of each group, the ethanol concentration given was 25%; in the other half, 35%; half the mice were sacrificed after 6 hr, and the other 1/2 after 24 hr. For concentrations of 25% and greater, increasing dosages of ethanol caused a rapid increase in gastric erosions. At the 5 g/kg dose, erosion incidence reached 100% with the 35% concentration. At any particular dosage, increasing concentration caused increased erosion. At the 4 and 5 g/kg doses, erosion incidence was 0 at the 10% concentration, 67% at 25%, 76% and 100% at 35%, and 100% at 50% ethanol. In the mice given ethanol for 3-5 days, the 3 g/kg dose over 5 days produced a 67% incidence of erosion for both concentrations after 6 hr, 33% after 24 hr, and 0% after 72 hr. Stress alone caused hyperemia in 25% of the mice, while ethanol alone caused 30% hyperemia in 25% concentration at 3 g/kg. Combination of the alcohol and the stress was less than additive. When 35% ethanol at 3 g/kg was given before stress was applied, effects were greater than additive (ethanol, 37% incidence; stress, 35%; both, 83%).

There was a 27% incidence of gastric erosion with 35% ethanol at 3 g/kg; stress gave a 4% incidence; and both, a 50% incidence when the stress was first, and 71% when the ethanol was first. It is concluded that incidence of gastric erosion is significantly potentiated by stress, especially when stress is applied after ethanol.

3009 THYROGASTRIC AUTOIMMUNE DISEASE. STUDIES ON THE CELL-MEDIATED IMMUNE SYSTEM AND HISTOCOMPATIBILITY ANTIGENS.

(E.) Whittingham, S.; Youngchaiyud, U.; Mackay, I. R.; Buckley, J. D.; Morris, P. J. (Walter and Eliza Hall Inst. Med. Res., Victoria, Australia). *Clin. Exp. Immunol.* 19(2): 289-299, 1975.

The role of cell (T-cell) mediated immunity was investigated in thyrogastric autoimmune disease. Twelve patients with autoimmune thyroiditis, and 27 with autoimmune gastritis were tested for specific cell-mediated responses to thyroid antigen by the leukocyte inhibition migration technique. In addition, general cell-mediated immunity to extrinsic antigens was tested for by cutaneous 1-chloro-2,4-dinitrobenzene response, response to 5 ubiquitous antigens, and lymphocyte blastogenic response to phytohemagglutinin. Finally, human leukocyte antigen (HL-A) phenotypes were determined. For each test, 26 normal volunteers served as controls. Leukocyte migration indices for chambers containing 100 μg of human thyroglobulin for the thyroiditis patients and controls were 0.79 and 1.1, resp. The indices for the chambers containing 200 μg gastric parietal cell microsomes were 0.78 and 1.1 for gastritis patients and controls, resp. When gastritis patient leukocytes were tested in human thyroglobulin and those from thyroiditis tested in gastric parietal cell microsomes results were ambiguous, leukocytes of some patients showing increased migration, and those of others decreased migration. The mean values (0.94 for thyroiditis patients tested with gastric parietal cell microsomes and 0.73 for gastritis patients tested with human thyroglobulin) were not significantly different from the control values (1.1) but the variability within the groups was highly significant in comparison with controls. Cutaneous response tests showed no significant results. HL-A typing showed a significant increase in frequency of HL-A3 and HL-A7 in the gastritis, but not the thyroiditis patients. However, this significance disappeared after a correction factor for the number of comparisons was applied. It is concluded that leukocyte inhibitory factor release is an index of specific cell-mediated immunity in thyrogastric autoimmune disease.

3010 STUDIES ON THE MECHANISM OF HYPOPROTEINEMIA IN GASTRIC CANCER. I. ALBUMIN LEAKAGE INTO THE STOMACH IN GASTRIC CANCER PATIENTS.

(E.) Yamaoka, K.; Noguchi, S.; Higashi, H.; Jinnai, D. (Osaka Univ. Med. Sch., Japan). *Jpn. J. Clin. Oncol.* 4(2):97-104, 1974.

The leakage of serum albumin into the stomach in cases of gastric carcinoma was determined in 30 patients; 8 patients without carcinoma served as controls. ^{131}I-Human serum albumin (100 μCi) was injected i.v. after 3 days administration of potassium iodide as a thyroid block. On the following day the gastric contents were aspirated, the lumen rinsed with saline, and the gastric juice was continually neutralized with phosphate buffer and collected for 1 hr. After centrifugation the sediment was counted by scintillation counter. Leakage index was expressed as A/B x 100 where A represents total count/min sediment collected in 1 hr, and B represents count/min of 1 cc serum. In 16 cases values were less than 50, in 8 cases 50-100, in 3 cases 100-200, and in 3 cases over 200; the total average was 102.42. In contrast, control values were always under 100 and averaged 32.44. To determine whether gastric cancer producing mucus was related to leakage, sections of surgical specimens from the patients were stained by the PAS method. No correlation was found. There was also no correlation between leakage and sex, age, gastric acidity, Borrmann's type, histological type or size of crater. However, patients with the highest leakage rates had marked lymphatic cell invasion by carcinoma cells. It is concluded that gastric cancer hypoproteinemia may stem from serum protein leakage into the stomach, which in turn may be due to stasis of the lymphatic fluid.

3011 THE INFLUENCE OF CARBENOXOLONE ON STEROID-INDUCED ULCER AND MUCUS SECRETION IN THE RAT.

(E.) Berg, M.; Geisel, A.; Necheles, H. (Michael Reese Hosp., Chicago, Ill.). *Am. J. Dig. Dis.* 20(2):134-137, 1975.

The protective effects of carbenoxolone sodium on prednisolone-induced ulceration were studied in 7 groups of 13 Holtzman rats each. The rats were fasted for 4 days and killed on the 5th with chloroform. Four groups were given prednisolone (3.5 or 5.0 mg s.c.) each dose with or without carbenoxolone (50 mg in 20 ml water, p.o.); 1 group carbenoxolone only; and 2 were control groups (1 fasted and 1 unfasted). Ulceration was observed in the stomachs, and mucus content was determined by determining dry weight before and after immersion in acetylcysteine. In all rats given drugs, ulceration of the squamous epithelium was found in only 1 of 50. There were no significant differences in size or number of ulcers of the glandular stomach in rats treated by both drugs or by prednisolone alone. The amount of mucus found in fasted control rats was significantly less than that of the treated groups and the fed controls, indicating that either drug or both prevents lowering of mucus in fasted rats. Histologic examination showed no differences between groups treated by prednisolone only, or by both drugs. It is concluded that prednisolone, carbenoxolone, or both are associated with prevention of ulceration, especially of the squamous epithelium, by maintaining normal amounts of mucus in fasted rats.

3012 FORMALDEHYDE-OZONE-INDUCED FLUORESCENCE IN GASTRIN-PRODUCING TUMORS.

(E.) Larsson,

L. I.; Sundler, F.; Grimelius, L.; Hakanson, R.; Buffa, R.; Solcia, E. (Dep. Histol., Univ. Lund, Sweden). *Virchows Arch.* [*Pathol. Anat.*] 365(3):179-184, 1975.

Gastrin and glucagon-producing tumors were examined for formaldehyde-ozone-induced fluorescence in 8 patients. Tumor material was obtained at surgery or autopsy and subjected to formaldehyde and ozone, or indirect immunofluorescence for gastrin, insulin, glucagon, or ACTH. In 4 patients with Zollinger-Ellison syndrome, 3 had tumors in the pancreas, and 1 in the duodenal submucosa. Formaldehyde-ozone-induced fluorescence was found in the peripheral tumor cells in each case, and gastrin immunofluorescence was found in the same areas. There was little or no glucagon, insulin or ACTH immunofluorescence. Of 2 cases of insulin-secreting tumors, 1 showed moderate insulin immunofluorescence, and no gastrin or other immunofluorescence, or formaldehyde-ozone fluorescence. The other showed intense immunofluorescence of the glucagon cells, less of the insulin cells, and still less of the gastrin cells. Formaldehyde-ozone fluorescence could not be determined. A liver metastasis of this tumor showed much gastrin, moderate glucagon, and no insulin immunofluorescence. A small amount of formaldehyde-ozone fluorescence was also detected. One case of glucagon-secreting tumor showed only intense glucagon immunofluorescence. One case of gastric carcinoma showed only intense gastrin immunofluorescence, and a strong formaldehyde-ozone-induced fluorescence. It is concluded that the association between gastrin immunoreactivity and formaldehyde-ozone-induced fluorescence is a feature of gastrin-producing tumor cells.

3013 POSTOPERATIVE REFLUX GASTRITIS. *(E.)* van Heerden, J. A.; Phillips, S. F.; Adson, M. A.; McIlrath, D. C. (Mayo Clin., Rochester, Minn.). *Am. J. Surg.* 129(1):82-88, 1975.

Postoperative reflux gastritis was studied in 49 patients (28 males, 21 females, mean age 49.9 yr) who had undergone gastric or duodenal surgery 0-42 yr (average 6.1 yr) prior to the study. The chief clinical features of the reflux alkaline gastritis were epigastric pain, bilious vomiting, anemia (hypochromic, microcytic, iron-deficiency type), and the dumping syndrome. Gastroscopy was the most valuable diagnostic procedure with adherent mucus, edema, mucosal friability, and erosions (most severe on the gastric aspect of the stoma) being the most characteristic features. Gastric biopsy supported the macroscopic diagnosis. The Roux-en-Y biliary diversion was performed in 31 of the patients and a jejunal interposition was performed in 12 patients, but the best clinical results were seen in the Roux-en-Y diversion group. Medical treatment for reflux gastritis has not been adequately evaluated.

3014 THE RELATIONSHIP BETWEEN BILE AND HYDROCHLORIC ACID IN THE PATHOGENESIS OF ACUTE GASTRIC EROSIONS. *(E.)* Himal, H. S.; Boutros, M.; Weiser, M. (Dep. Exp. Surg., McGill Univ., Montreal, Canada). *Am. J. Gastroenterol.* 62(5):405-409, 1974.

The relationship between bile and hydrochloric acid in the pathogenesis of acute gastric erosions was studied in 15 mongrel dogs using explants of antrum which were placed within lucite chambers. Instillation of a control solution (120 mEq/liter HCl and 40 mEq/liter NaCl) into the antral chamber for four consecutive 30-min periods led to a net H^+ loss and a net Na^+, Cl^- and K^+ gain, but there was no measurable volume gain. Fresh canine gallbladder bile (10 ml) in contact with antral mucosa did not lead to gross or microscopic erosions, but instillation of the acid/saline control solution in the postbile period led to increased net H^+ Na^+ flux, net K^+ gain and net Cl^- loss, and acute erosions which appeared within 5 min of the control solution instillation. These erosions increased in size and number throughout the four test periods. There was minimal diffusion of H^+ into the antral mucosa, gallbladder bile alone did not cause acute antral mucosa erosions, but bile in association with hydrochloric acid did cause acute erosions when in contact with the antral mucosa. The underlying mechanism may be related to alterations in lysosomal activity.

3015 ATROPHIC GASTRITIS IN GASTRECTOMY SPECIMENS. *(E.)* Skinner, J. M.; Heenan, P. J.; Whitehead, R. (Radcliffe Infirm., Oxford, England). *Br. J. Surg.* 62(1):23-25, 1975.

Gastrectomy specimens from carcinoma and gastric ulcer patients were studied with regard to type and distribution of chronic gastritis, the presence of intestinal metaplasia, the site of the lesion, and any previous surgery. Blocks of tissue were taken from various areas of the stomach and stained by hemotoxylin and eosin, PAS, Foot's reticulin, and a modified Maxwell's method. Atrophic gastritis and intestinal metaplasia occurred almost entirely in the pyloric region or in the adjacent lesser or greater curves. Superficial gastritis was also seen in the pyloric region in about half the pyloric ulcer cases, while body ulcers were seen in all areas. This distribution was similar to that seen in the carcinoma cases, and in cases of gastrectomy following previous gastrojejunostomy for duodenal ulcer. There was a close association of atrophic gastritis and intestinal metaplasia with the development of cancer, and a high cancer rate after stomach operations for benign conditions. The similarity of distribution of atrophic gastritis and intestinal metaplasia in the stomach with body ulcer to that in cancer and after gastrojejunostomy suggested a higher cancer risk in body ulcer cases.

3016 THE ROLE OF STARCHES IN THE ETIOLOGY OF GASTRIC CANCER. *(E.)* Modan, B.; Lubin, F.; Barell, V.; Greenberg, R.; Modan, M.; Graham, S. (Chaim Sheba Med. Cent., Tel Hashomer, Israel). *Cancer* 34(6):2087-2092, 1974.

The role of starches in the etiology of gastric cancer was studied in gastric cancer patients, and several matched control groups (colorectal cancer patients; surgical cases with neither malignancy nor gastrointestinal disorders; and neighborhood controls).

The control groups were matched to the gastric cancer cases according to age, sex, ethnic origin, and length of residence in Israel. Comparison of the gastric cancer cases and the controls pertained to individual food items and groups of foods combined on the basis of common nutritional components, and paired t-tests were used to evaluate results. The gastric cancer patients ate on the average 26 items more frequently, 16 items with equal frequency and eight items less frequently than the colon cancer cases. For every food item eaten less frequently, three were eaten more frequently by the gastric cancer patients. There was a higher consumption frequency of starches among the gastric cancer patients, and this was not related to a socioeconomic differential. It was suggested that long-term consumption of starchy foods may affect the mechanics of gastric acid secretion and thus render the gastric mucosa more susceptible to exogenous carcinogens.

3017 MUCOSAL AND HEPATIC METABOLISM DURING THE SPONTANEOUS DISAPPEARANCE OF SALICYLATE-INDUCED GASTRIC EROSIONS.

(E.) Hietanen, E. (Dep. Physiol., Univ. Turku, Finland). *Am. J. Dig. Dis.* 20(1):31-41, 1975.

The appearance and healing of salicylate-induced gastric erosions, and the mucosal and hepatic detoxification activity of salicylate was studied in 98 adult Wistar rats (84 males and 14 females). Salicylic acid was administered intragastrically (1-2 mM/kg body weight) once a day for 1-14 days, and the rats were killed 12 hr after the last dose. A single dose of salicylic acid (1-2 mM/kg body weight) caused erosions and bleeding in the gastric mucosa of all rats. After three daily doses, only slight gastric hemorrhage was observed in one of five rats at the 1 mM/kg dose, but at the dosage level of 2 mM/kg bleeding was present in two of five rats. Hepatic protein content decreased slightly after treatment, and in 2 weeks the decline was significant. The duodenal decrease was nearly significant after one mM/kg dose; after three doses there was a transient increase in protein content, whereas a significant decrease after three doses of 2 mM/kg was found. Gastric protein content showed a significant decrease after a single dose, but returned to control levels within 2 weeks. Gastric and duodenal UDP glucuronyltransferase activity decreased after a single dose of salicylic acid, but when the treatment was continued the enzyme activity increased above control level and in 2 weeks had returned to control level. Although the salicylates inhibited gastroduodenal glucuronidation *in vitro*, there was no substrate effect present when the rats were killed. Duodenal 3,4-benzpyrene hydroxylase activity was not affected by salicylic acid, and the gastric activity of this enzyme could not be measured by the methods used. Hepatic detoxification capacity was stable, however a slight depression of 3,4-benzpyrene hydroxylase activity did occur within 2 weeks. The results suggest that mucosal detoxification capacity may have a role in the pathogenesis of drug-induced gastric erosion. Gastric mucosa adapted to repeated salicylic acid administration, having reduced susceptibility to drug-induced erosions.

3018 GASTRIC MUCOSAL ISCHEMIA IN EXPERIMENTAL STRESS ULCER.

(E.) Sales, J.; Norton, L.; Nolan, P.; Rankin, J.; Eiseman, B. (Denver Gen. Hosp., Colo.). *J. Surg. Res.* 18(1):65-74, 1975.

Blood flow patterns were quantitatively studied in the stomachs of 25 6-12-week-old piglets using isotopically labeled microspheres to investigate the pathogenesis of gastric ulceration following major blood loss. The left carotid artery and right external jugular vein were catheterized with 15-gauge polyethylene tubing. A similar catheter passed through the right femoral artery into the abdominal aorta. From 600,000 to 1,000,000 carbonized plastic microspheres labeled with ^{141}Cerium with a specific activity of 10 mCi/g were injected over 3 sec into the left ventricle. All 4 nonhemorrhaged animals survived anesthesia. Fifteen of 21 piglets survived hemorrhagic shock. Five of six piglets in which hemorrhagic shock was induced by bleeding 40% of the estimated blood volume survived hemorrhage. No gastric ulceration occurred in the survivors, which were sacrificed immediately after hemorrhage. Total gastric blood flow ranged from 18 to 81 ml/min. Mean values of total gastric blood flow showed a 70% decrease and these changes were reflected in the fall of average flow/g of the fundus-body (mean 59%) and antrum (mean 70%). Five of nine animals survived 90 min of hemorrhagic shock. Three survivors developed ulcers in the body of the stomach and two showed petechial lesions in the fundus. Total gastric blood flow was 9.5-60 ml/min. Blood flow to the fundus body decreased a mean 76% and to the antrum a mean 77%. After 90 min of shock, gastric mucosal flow became grossly uneven: 48% of fundus-body squares (1 cm each) had normal, 19% had high, and 33% had low flow compared to prehemorrhage values. Squares with low flow were distributed in an uneven fashion in the fundus-body and ulceration occurred principally in these squares. Five of six piglets survived 90 min of shock and retransfusion. Three survivors developed ulcers in the gastric corpus within 2 hr of hemorrhage. Total gastric blood flow ranged from 5.3 to 14 ml/min. The distribution of gastric blood flow was uneven after 90 min of shock. After retransfusion flow became even in two piglets but remained grossly uneven in three. Ulceration occurred in areas of low relative flow. These experiments show that decrease in blood flow in the swine stress ulcer model is not evenly distributed and that parts of the fundus-body and antrum are disproportionately ischemic. The findings suggest that uneven flow is not due to ulcer formation but that ulceration is etiologically related to ischemia.

3019 MORPHOLOGY OF GASTROINTESTINAL EFFECTS OF ASPIRIN.

(E.) Hahn, K. J.; Krischkofski, D.; Weber, E.; Morgenstern, E. (Dep. Med., Univ. Heidelberg, Germany). *Clin. Pharmacol. Ther.* 17(3):330-338, 1975.

The effect of aspirin on the ultrastructure of gastric mucosa and intestinal mucosal cells was investigated in the guinea pig and in man. Of 6 patients undergoing Billroth II operations, 3 were given 1 g aspirin/day 3-5 days prior to surgery, the remaining

3 serving as controls. For comparison, 5 guinea pigs were given 1 ml 45 mM aspirin solution in 2.5% alcohol 3 times/day for 4 days. Five control animals received only the alcohol. In 2 of 4 groups (2 animals each) gastric secretion was stimulated by 2 mg/kg betazole. In the other 2 groups, secretion was inhibited by 1 U/kg secretin. In all 4 groups, 1 ml of a 45 mM aspirin solution in 0.07 N NaOH, or 1 ml of pure 0.07 N NaOH was administered 15, 60, and 120 min after injection. Gastric and intestinal mucosa of control patients appeared normal under both light and electron microscopy. In patients given aspirin, surface mucous cells showed signs of cytolysis and desquamation. Many gastric parietal cells showed up to a 1 μm increase in lysosomal diameter and contained homogeneous and lamellar material, vesicular structures, and lipid droplets. No changes were found in the intestinal mucosa. In the guinea pigs, 4 day administration caused gastric mucosal superficial cells to exhibit the cytolytic signs of swollen nuclei and lighter cytoplasm. Similar effects, plus many small erosions, resulted from short-term aspirin treatment and betazole. The electron microscope showed surface mucosal cells exhibiting such cytolytic signs as pyknosis of the nucleus, clumping of the chromatin, and lysis of the cytoplasm and organelles. Lysosomes were not observed in mucosal cells, even after lengthy aspirin exposure. In the intestinal mucosa, electron microscopy showed fewer secondary lysosomes and multivesicular bodies than the gastric mucosa of human controls and control animals. Secondary lysosomes resembled those of gastric parietal cells in aspirin-treated patients. It is concluded that cytoplasmic damage by aspirin may induce hydrolase transport by multivesicular bodies and formation of autophagolysosomes.

3020 DISTRIBUTION OF GASTRIN IN HUMAN DIGESTIVE ORGANS DEMONSTRATED BY DIRECT IMMUNOFLUORESCENCE.

(E.) Tobe, T.; Henmi, D.; Fukuchi, K.; Chen, S. T.; Tachibana, S. (Kyoto Univ. Med. Sch., Japan). *Arch. Histol. Jpn.* 37(1):59-72, 1974.

Immunofluorescence studies were performed on different portions of the human digestive tract to determine gastrin distribution. Antral stomach tissue from 15 gastric carcinoma patients, 15 peptic ulcer, and 4 benign adenoma patients given gastrectomies; and normal tissues from stomach, duodenum, jejunum, ileum, colon, rectum, pancreas, parotid gland and submandibular gland were examined. To determine glycine gastrin release, an antral section was immersed in 0.5 M glycine for 30 min and examined by immunofluorescence. Gastrin-containing cells were found in quantity in the antrum of the stomach, but none in the cardia. They were dispersed in the cryptal epithelium and in the middle zone of mucosal thickness. Most heavy concentrations were 2-4 cm proximal to the pylorus, becoming sparser in the pylorus. In the duodenum, the number of gastrin containing cells was lower than in the antrum and became increasingly lower distal to the pylorus. None were found in the jejunum, ileum, colon, rectum, esophagus, pancreas, parotid or submandibular glands. Gastrin fluorescence in antral tissue showed a slight decrease after immersion in glycine solution. In contrast, complete gastrin release resulted after freezing in an isopentane flask at -30 to -70 C. It is concluded that the gastrin-containing cells are only found in the antrum in great numbers, and to a lesser extent in the duodenum.

3021 CYTOHISTOCHEMICAL STUDIES OF THE EXOCRINE PANCREAS AFTER SUBTOTAL RESECTION OF THE STOMACH.

(Rus.) Zufarov, K. A.; Tashkhodzhaiev, P. I.; Alizhanov, G. A.; Gontmakher, V. M. (Tashkent Med. Inst., USSR). *Arkh. Anat. Gistol. Embriol.* 67 (9):41-47, 1974.

Changes in the exocrine pancreas were studied in mongrel dogs sacrificed 5-360 days after subtotal stomach resection. In the early postoperative period (5-20 days), inflammatory, hemodynamic and slight destructive changes were observed. Intrapancreatic vessels and capillaries were dilated and filled with blood, and the intralobular connective tissue was swollen and infiltrated by lymphohistiocytic elements. The size of the nuclei in the acinar cells decreased by 6.5% compared with the controls. One to three months after surgery, the vasomotor and inflammatory process became subdued, while destructive processes developed. In addition to atrophic changes in the pancreas and the inhibited activity of the acinar cells, there was evidence of impaired secretion which was demonstrated by the presence of immature secretory granules in the acinar cells. It is suggested that subtotal resection entailed more profound degenerative changes in the pancreatic parenchyma than vagotomy. The degenerative and atrophic changes may be related to the impaired neurohumoral regulation of the pancreatic function. One year after surgery, a steady improvement in the histostructure of the exocrine pancreas was observed, characterized by the presence of enlarged acini, hypertrophy of acinar cells, elevated content of nucleic acids in the cells and an increase in the average size of the nuclei in the acinar cells. A partial regeneration of the pancreas as a long-term result of stomach resection may suggest a possible enhancement of the hormone influx from the jejunum. However, due to a slow rearrangement of this part of the stomach, the atrophy of the pancreas and the inhibition of its excretory function is the early postoperative consequence of the resection.

3022 REOPERATION ON THE OPERATED STOMACH.

(Ger.) Schreiber, H. W.; Schumpelick, V.; Kauffmann-Mackh, G. (Surg. Clin., Univ. Hamburg-Eppendorf, Germany). *Therapiewoche* 24(17):1917-1926, 1974.

3023 UNUSUAL FINDINGS IN THE OPERATED STOMACH.

(Ger.) Rosch, W.; Weidenhiller, S. (Med. Clin. Polyclin., Univ. Erlangen-Nuremberg, Erlangen, Germany). *Z. Gastroenterol.* 12(1):31-32, 1974.

3024 SERUM GASTRIN LEVEL AND GASTRIC SECRETION FOLLOWING PARTIAL AND TOTAL GASTRECTOMY. *(Ger.)* Fritsch, W. P.; Muller, J.; Rick, W.; Hausamen, T. U. (1st Med. Clin. A, Univ. Dusseldorf, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:826-827, 1973.

3025 DO HIGH BLOOD MAGNESIUM LEVELS RESULT IN DRUG-INDUCED VAGOTOMY? *(Ger.)* Strauch, M.; Lux, G.; Lux, E.; Ottenjann, R. (Neuperlach Munic. Hosp., Munich, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:834-837, 1973.

3026 ORAL ANTIBIOTIC THERAPY IN PATIENTS WITH PARTIAL GASTRECTOMY. *(Ger.)* Lode, H.; Frisch, D.; Naumann, P. (Med. Clin. Polyclin., Free Univ. Berlin, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:837-839, 1973.

3027 THE EFFECT OF INTRAVENOUS AMINOPLEX 5 ON SERUM GASTRIN AND GASTRIC SECRETION. *(E.)* Chatamra, K.; Pigott, H. W. S.; MacNaughton, J. I.; Wastell, C. (Gordon Hosp., London, England). *Postgrad. Med. J.* 51(591):1-3, 1975.

3028 A METHOD FOR INTRAGASTRIC TITRATION OF GASTRIC JUICE BY MEANS OF AN INTESTINAL TRANSMITTER PROBE. *(Ger.)* Unger, W.; Kaess, H. (Med. Clin., Univ. Heidelberg, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:830-832, 1973.

3029 GASTRIC BYPASS FOR MORBID OBESITY IN CHILDREN AND ADOLESCENTS. *(E.)* Soper, R. T.; Mason, E. E.; Printen, K. J.; Zellweger, H. (Univ. Iowa Hosp., Iowa City). *J. Pediatr. Surg.* 10(1):51-58, 1975.

3030 CONGENITAL GASTRIC DIVERTICULA. *(Rus.)* Gavrish, N. Iu. (Chernigov Dist. Oncol. Dispensary, USSR). *Vrach. Delo* (12):69-71, 1974.

3031 RELATIONS BETWEEN MUCOSAL MORPHOLOGY, THE PEAK ACID OUTPUT (PAO), AND THE SERUM GASTRIN LEVEL IN PATIENTS WITH HYPERCHLORHYDRIA, NORMOCHLORHYDRIA, HYPOCHLORHYDRIA, AND ACHLORHYDRIA. *(Ger.)* Miederer, S. E.; Stadelmann, O.; Kaess, H.; Elster, K. (Med. Polyclin., Univ. Bonn, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:823-825, 1973.

3032 HEREDITARY HEMORRHAGIC TELANGIECTASIA: PRESENTING AS AN UNUSUAL GASTRIC LESION. *(E.)* Tedesco, F. J.; Hosty, T. A.; Sumner, H. W. (Washington Univ. Sch. Med., St. Louis, Mo.). *Gastroenterology* 68(2):384-386, 1975.

3033 GASTRIC LYMPHOMAS: DIAGNOSIS AND THERAPEUTIC PROBLEMS. *(Ger.)* Rosch, W.; Hartwich, G. (Med. Clin. Polyclin., Univ. Erlangen-Nuremberg, Erlangen, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:839-841. 1973.

3034 GASTRIC LEIOMYOMA COMPLICATED BY PROFUSE INTRAABDOMINAL BLEEDING. *(Rus.)* Osingolts, S. L.; Khomut, I. M.; Ostrovskii, E. V.; Ponomarenko, E. I. (Kiev Med. Inst., USSR). *Klin. Khir.* (10): 47-48, 1974.

3035 GASTRIC LIPOMA IN AN AFRICAN. *(E.)* Wicks, A. C. B.; Thomas, G. E. (Harari Hosp., Salisbury, Rhodesia). *Am. J. Gastroenterol.* 62(6): 531-533, 1975.

3036 DIFFICULTIES IN THE DIFFERENTIAL DIAGNOSIS OF DIFFUSE LYMPHATIC HYPERPLASIA OF THE STOMACH. *(Ger.)* Gloor, F.; Hammer, B. (Canton. Hosp., St. Gallen, Switzerland). *Z. Gastroenterol.* 12(1):42-43, 1974.

3037 POLYADENOMATOSIS EN NAPPE OF THE ANTRUM. *(Fr.)* Hezez, G.; Lesbros, F.; Mathon, C.; Boulez, J.; Guillet, R. (no affil.). *Lyon Chir.* 70(6):418-419, 1974.

3038 EXPERIENCE WITH RATIONAL PARENTERAL FEEDING IN PATIENTS WITH STOMACH CANCER AFTER SURGERY. *(Rus.)* Glants, R. M.; Gnatyshak, A. I.; Bilynskii, B. T.; Iolych, M. M.: Osmolian, Zh. V. (Lvov Sci. Res. Inst. Hematol. Blood Transfus., USSR). *Klin. Khir.* (10):5-9, 1974.

3039 THE NATURE OF PAIN IN DIFFERENT STAGES OF GASTRIC CANCER AND PRECANCER. *(Rus.)* Martynenko, A. M. (Tula Reg. Oncol. Dispens., USSR). *Klin. Khir.* (10):1-5, 1974.

3040 PAPILLIFEROUS ADENOMAS OF THE STOMACH AND CHRONIC GASTRITIS WITH INTESTINAL METAPLASIA. *(Sp.)* Palma, F. (Princesa de Espana Hosp. Cent., Jaen, Spain). *Rev. Esp. Enferm. Apar. Dig.* 44(7):707-718, 1974.

3041 A CLINICAL EVALUATION OF POSTOPERATIVE ALKALINE REFLUX GASTRITIS. *(E.)* Bushkin, F. L.; Deford, J. W.; Wickbom, G.; Woodward, E. R. (Coll. Med., Univ. Florida, Gainesville). *Am. Surg.* 41(2):88-93, 1975.

3042 PHLEGMONOUS GASTRITIS. *(E.)* Miller, A. I.; Smith, B.; Rogers, A. I. (Univ. Miami, Sch. Med., Florida). *Gastroenterology* 68(2):231-238, 1975.

3043 ATROPHIC GASTRITIS. STRUCTURAL AND ULTRASTRUCTURAL ALTERATIONS, EXFOLIATIVE CYTOLOGY AND ENZYME CYTOCHEMISTRY AND HISTOCHEMISTRY, PROLIFERATION KINETICS, IMMUNOLOGICAL DERANGEMENTS AND OTHER CAUSES, AND CLINICAL ASSOCIATIONS AND SEQUELLAE. *(E.)* Glass, G. B. J.; Pitchumoni, C. S. (New York Med. Coll., N.Y.). *Hum. Pathol.* 6(2):219-250, 1975.

3044 EXPERIMENTAL STUDY OF THE PATHOGENESIS OF BLEEDING EROSIVE GASTRITIS INDUCED BY DRUGS. *(It.)* Trabucchi, E.; Ferla, G. F.; Napoli, P. A.; Bonomi, A. (1st Surg. Clin., Univ. Milan, Italy). *Arch. Ital. Chir.* 97(1):5-15, 1973.

3045 CAUSE OF THE INJURIOUS EFFECT OF ACETYLSALICYLIC ACID AND PHENYLBUTAZONE ON THE GASTRIC MUCOSA. *(Ger.)* Hahn, K. J. (Med. Clin., Univ. Heidelberg, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:828-830, 1973.

3046 RELATION BETWEEN GASTRIC HYDROCHLORIC ACID SECRETION AND CHRONIC GASTRITIS, AGE, SEX, AND DIAGNOSIS. *(Ger.)* Wolff, G.; Gutz, H. J.; Jacobasch, K. H. (Robert Rossle Clin., Berlin-Buch, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 34(1):1-8, 1974.

3047 LYSOLECITHIN IN THE GASTRIC CONTENTS. *(Ger.)* Clemencon, G.; Burgi, W.; Kaufmann, H. (Canton. Hosp., Olten, Switzerland). *Z. Gastroenterol.* 13(1):1-4, 1975.

3048 EARLY DIAGNOSIS OF CARCINOMAS OF THE STOMACH AND COLON. *(Ger.)* Mappes, G. (St. Vincentius Hosp., Karlsruhe, Germany). *Therapiewoche* 48(24):5675-5678, 1974.

3049 PRIMARY NEOPLASMS OF THE GASTRIC STUMP. *(Sp.)* Moreno, C.; Culebras Fernandez, J. M. (Jimenez Diaz Found., Madrid, Spain). *Rev. Esp. Enferm. Apar. Dig.* 44(8):785-796, 1974.

3050 CLINICAL TRIAL OF ULPIR GASTRO. *(Sp.)* Guemes Diaz, F.; Fernandez Navarro, M. (Dep. Gastroenterol., I.N.P., Madrid, Spain). *Rev. Esp. Enferm. Apar. Dig.* 44(8):837-844, 1974.

3051 ONE CASE OF MENETRIER'S DISEASE: FINDINGS FIVE YEARS AFTER TOTAL GASTRECTOMY. *(Fr.)* Hasbroucq, R.; Luez, J.; Modaine, L.; Huart, F.; Leduc, M.; Durieux, J. (no affil.). *Lille Chir.* 29(2):53-56, 1974.

3052 GASTRIC POLYPS: PROGNOSIS AND TREATMENT. *(Ger.)* Botticher, R.; Bunte, H.; Hermanek, P.; Rosch, W. (Surg. Clin., Univ. Erlangen-Nuremburg, Erlangen, Germany) *Dtsch. Med. Wochenschr.* 100(5):167-170, 1975.

3053 LIPOMAS OF THE STOMACH. *(Rus.)* Suvorova, T. A.; Popova, Z. P.; Lukichev, P. M.; Kamonova, S. I. (Moscow Res. Inst. Roentgenol. Radiol., USSR). *Khirurgiia (Mosk.)* (3):57-60, 1973.

See also, 2866, 2877, 2879, 2890, 2893, 2895, 2943, 2954, 2957, 2959, 2988, 2992, 2995, 2998, 3003, 3060, 3079, 3198, 3199, 3306, 3671, 3672, 3690, 3694, 3734.

STOMACH

Peptic Ulcers

3054 INHIBITION OF GASTRIC SECRETION IN MAN BY ORAL ADMINISTRATION OF CALCITONIN. *(E.)* Ziegler, R.; Minne, H.; Hotz, J.; Goebell, H. (Cent. Intern. Med. Pediatr., Univ. Ulm, Germany). *Digestion* 11(1/2):157-160, 1974.

The sensitivity of the human stomach to oral calcitonin was studied. Gastric juice was collected from normal subjects at 30-min intervals, following calcitonin administration by stomach tube, and again after the administration of pentagastrin (0.8 μg/kg/hr i.v.) followed by calcitonin. Determinations were made for gastric acidity, pepsin content, and serum calcium. Synthetic human calcitonin induced a distinct inhibition of basal as well a pentagastrin-stimulated gastric secretion and pepsin output which was primarily a volume reduction. Acid and pepsin concentrations only slightly diminished. The inhibition was induced by 50-100 MRC U of human calcitonin or 1,400 MRC U of salmon calcitonin. Serum calcium levels did not change during the tests. Because of its therapeutic implications, an investigative trial of oral calcitonin administration in peptic ulcer disease is suggested.

3055 INTESTINAL CALCIUM ABSORPTION AFTER PARTIAL GASTRECTOMY. *(E.)* Nicolaou, A.; Alevizaki, C. C.; Ikkos, D. G.; Philokyprou, G. (Hippokrateion Hosp., Athens Univ. Med. Sch., Greece). *Am. J. Gastroenterol.* 62(6):516-525, 1974.

The intestinal absorption of calcium after gastrectomy was determined by a double radiocalcium tracer technique in 39 patients who underwent Billroth I or II operations for peptic ulcer between 4 months and 30 yr prior to the study. Each was given an oral dose of 140 mg labeled $CaCl_2$ in water along with a standardized light breakfast containing 80 mg calcium.

In all but 7 patients, fasting serum calcium, inorganic phosphate, and alkaline phosphatase, were measured and a d-xylose test was performed. The coefficient of true intestinal calcium absorption (a) varied between 7.7% and 5.0%. The mean $\log_{10}$ a-values of the gastrectomized patients (1.421) were significantly lower than those of the controls (1.536). The a-values were influenced by the interval between the operation and the study. Thus the mean $\log_{10}$ a-value of the early post-gastrectomy group (0-5 yr) was significantly lower (1.355) than that of the controls (1.530) or of the late post-gastrectomy group (6-30 yr, 1.478). By plotting a-values against patients' ages, age was ruled out as a factor in the difference between values of normal and gastrectomized patients. No significant correlations were found between a-values and inorganic phosphate or alkaline phosphatase values, or d-xylose absorption test results. Serum calcium showed a positive linear correlation for the 6-30 yr postgastrectomy group. Results confirm previous findings that reduced intestinal calcium absorption occurs in post-gastrectomy patients.

3056 SALIVARY SECRETION IN EVOLUTIVE AND QUIESCENT DUODENAL ULCER. *(E.)* Andre, F.; Descos, F.; Andre, C.; Lambert, R. (INSERM, Edouard-Herriot Hosp., Lyon, France). *Digestion* 11(1/2):98-104, 1974.

A comparison of salivary and pharyngeal secretions in healthy subjects and in patients with a duodenal ulcer was made to determine the significance of the outputs of organic and inorganic components of the saliva. Samples of the saliva stimulated by a gastric tube were collected from 9 healthy male volunteers (mean age 31 yr) and 9 male patients suffering from duodenal ulcer (mean age 33 yr). The volume was measured, and the constituents determined (fucose, total hexosamines, sialic acid, sulfate, proteins, free calcium and total calcium). In patients with an evolutive duodenal ulcer, the salivary outputs of fucose, hexosamines and sulfate were lower than in controls, and most of the calcium was found in the bound form. In patients with healed duodenal ulcer, the salivary outputs were greater than in controls, and the distribution pattern of calcium was the same as that in healthy subjects. It is suggested that the decreased glycoprotein secretion observed in the saliva of patients with an evolutive duodenal ulcer is a transient abnormality concomitant to the duodenal crater rather than a determining factor, and that the increased secretion measured in patients with healed ulcer could be related to enlargement of their salivary glands.

3057 PLASMA-GASTRIN AND ACID SECRETION IN PATIENTS WITH PEPTIC ULCERATION. *(E.)* Wesdorp, R. I. C.; Fischer, J. E. (Massachusetts Gen. Hosp., Boston). *Lancet* 2(7885):857-860, 1974.

In 132 patients with peptic ulceration, 101 with a duodenal ulcer and 31 with a gastric ulcer, the relationship between basal plasma-gastrin levels, basal intragastric pH, and basal and stimulated gastric-acid secretion was examined. The mean basal plasma-gastrin level for the 101 duodenal ulcer patients was 61 pg/ml, and was 93 pg/ml for gastric ulcer patients, compared to 54 pg/ml in 30 healthy controls. The mean basal intragastric pH was significantly lower in the duodenal ulcer patients (1.8) than in gastric ulcer patients (2.6). Throughout the study, basal plasma-gastrin appeared to be related to basal intragastric pH, but when the patients were grouped according to their pH, and plasma-gastrin values were compared, no significant differences were found between the groups. When they were grouped according to their basal gastric-acid secretion and their plasma-gastrin values compared, there was no significant difference between the groups and no inverse relationship. The results suggest that the duodenum may make a major contribution to basal circulating gastrin or that there may be some autonomy of gastrin release in duodenal-ulcer patients, since there was no decrease in plasma-gastrin levels as basal gastric-acid secretion increased. It also appears that basal acid secretion is independent of plasma-gastrin.

3058 DUODENAL ULCERATION IN ALLERGIC CHILDREN. *(E.)* Rebhun, J. (Dep. Med., Loma Linda Univ., Calif.). *Ann. Allergy* 34(3):145-149, 1975.

A diverse group of children with duodenal ulcerations and allergies was studied to determine whether the children's ulcer symptoms were functional or morphological. Children (43, 5-18 yr) suffering from a variety of allergies showed manifestations of ulceration classified as moderate in 30 cases, severe in 10, and intractable in three. X-ray findings showed 25 with definite ulceration, 12 with no definite crater but with spasm of the antrum and/or pylorus, and six with suspicious ulceration and spasm. Most of the ulcers responded to conventional ulcer therapy and were not present when x-rayed again 4-5 weeks later. The functional stomach ache often observed in allergic children might be explained by the organic changes. It is suggested that the chronic release of histamine-like substances, stress connected with a chronic illness, food sensitivities, and ulcerogenic drugs might be the factors affecting the allergic individuals so that the incidence of duodenal ulceration is greater among them than in the nonallergic children.

3059 THE ROLE OF SECRETIN IN THE INHIBITION OF GASTRIC SECRETION BY INTRADUODENAL ACID. *(E.)* Ward, A. S.; Bloom, S. R. (Sheffield R. Infirm., London, England). *Gut* 15(11):889-897, 1974.

The effect of intraduodenal acid and exogenous secretin on pentagastrin-stimulated gastric secretion was studied in 12 normal subjects and 23 patients with chronic duodenal ulceration. Pentagastrin (6 μg/kg/hr i.v.) was administered to normal subjects and duodenal ulcer patients followed by 40 ml of 0.1 N HCl labeled with 2% polyethylene glycol infused into the distal duodenum. Gastric samples were collected at 10-min intervals, and plasma secretin levels were monitored using radioimmunoassay. Significant inhibition of gastric secretion occurred in the normal subjects (4.77-2.88 mEq/10 min) and duodenal ulcer patients (7.41-5.53 mEq/10 min). A significant rise in plasma secretin was observed in both groups (normals, 19.1-58.3 pg/ml; ulcer patients, 13.2-42.9 pg/ml), but there was a complete lack of correlation between the magnitude of the secretin response and the degree of gastric inhibition. Ten subjects received intraduodenal acid and a subsequent infusion of exogenous secretin (0.125-0.25 U/kg over 6 min). Gastric inhibition occurred after the acid instillation but not after the secretin infusion; plasma secretin levels rose to values greater than those produced by intraduodenal acid. The results provide evidence that secretin is not significantly involved in the inhibitory response to intraduodenal acid in man.

3060 STUDIES ON CHANGES IN LIPID PROFILES OF THE RAT GASTRIC MUCOSA WITH STRESS ULCERS.

(E.) Slomiany, A.; Slomiany, B. L.; Horowitz, M. I. (New York Med. Coll., N.Y.). *Clin. Chim. Acta* 59(2): 215-226, 1975.

Changes in gastric mucosal neutral lipids, phospholipids, and glycolipids were studied in normal rats and in restrained rats which developed stress ulcers. Sprague-Dawley rats were fasted and immobilized in wire screens for 24 hr. The animals were killed, the stomachs removed and examined for ulceration, and the gastric mucosa scraped and prepared for analyses. Organic solvent extraction, silicic acid column, and thin-layer chromatography were employed to separate, and gas-liquid chromatography and spectrophotometry to quantitize the individual lipid components. Chemical analysis revealed profound alterations in the mucosal lipid profiles of rats with gastric mucosal erosions. Cholesterol esters were markedly elevated, 12.11 μM/100 mg lipids compared to 2.38 μM/100 mg lipids in controls. Cholesterol, free fatty acids, and phosphatidylethanolamine were lower in the extracts of ulcerated tissue, but the titer of lysophospholipids was about 8 times higher than in the controls. Lipid phosphorus was also elevated in stressed rats. The amount of neutral glycolipids was similar for both groups, but tetra- and oligohexoside ceramides, which were present in the gastric mucosa of the control rats, were virtually absent from the ulcerated mucosa. In contrast to the alterations in lipid profile, the total lipid weight/tissue preparation was very similar for the ulcerated and normal control groups. It is suggested that a shedding of membrane fragments could lead to a selective loss of certain lipid constituents, or that surface-active lipids may be causal agents in altering lipid composition of the mucosa.

3061 A COMMON DENOMINATOR IN THE PATHOGENESIS OF PEPTIC ULCERATION.

(E.) Fiddian-Green, R. G. (Univ. Cape Town Med. Sch., South Africa). *S. Afr. J. Surg.* 12(3):163-172, 1974.

The gastric secretory responses to histamine were analyzed in 59 controls, 70 patients with duodenal ulcers and 32 patients with gastric ulcers to reassess data concerning ulcer pathogenesis. Gastric juice was collected by a nasogastric tube following i.v. infusion of histamine (0.04 mg/kg/hr), then measured for volume, titratable acidity, and concentration of Na^+, K^+, and Cl^-. Phenol red was used as an inert marker of pyloric reflux; sodium was used as a means of calculating volume of pyloric reflux within aspirated gastric juice. A statistically significant hypersecretion of gastric juice and an excessive degree of pyloric reflux were found in only a minority of patients. In the controls there was a significant positive correlation between the magnitude of the pyloric losses of acid and the bicarbonate concentration in the duodenum juice. There was no such correlation in either the patients with duodenal ulcers or the patients with gastric ulcers. The abnormal response to duodenal acidification in ulcer patients is the basis for a working hypothesis to account for the abnormalities in gastric secretory responses observed in patients with peptic ulcers.

3062 ACID HYPERSECRETION AND DUODENAL ULCERS PRODUCED BY CYSTEAMINE IN RATS.

(E.) Groves, W. G.; Schlosser, J. H.; Mead, F. D. (Dep. Pharmacol., Smith Kline French Lab., Philadelphia, Pa.). *Res. Commun. Chem. Pathol. Pharmacol.* 9(3): 523-534, 1974.

The role of acid hypersecretion in the pathogenesis of cysteamine duodenal ulcer was studied in rats. Cysteamine, in various doses, was administered p.o. to 1-hr pylorus-ligated Charles River rats. The animals were autopsied 24 hr after the initial dose to determine the number and appearance of gastric and duodenal ulcers. A dose-related ulcerogenic effect was seen, and at 1 g/kg dose 1/2 the rats died. Cysteamine greatly increased acid secretion: 0.25 g/kg resulted in acid output 78% above controls; 1 g/kg resulted in acid output 277% above controls; the peak occurred 6-7 hr post-drug (0.5 g/kg) and was 662% above controls. Ulcers tended to occur selectively in the duodenum at low dose (88% incidence in duodenum, 24% incidence in stomach) but found equally often in stomach and duodenum at high dose. Their formation was associated with prolonged hypersecretion of highly acidic gastric juice thought to be the result of endogenous histamine release by cysteamine and/or its metabolite, cystamine.

3063 REPRODUCIBILITY OF PLASMA GASTRIN CONCENTRATION AND GASTRIC PEPSIN OUTPUT AFTER INSULIN-INDUCED HYPOGLYCAEMIA.

(E.) Elder, J. B.; Walker, D. I.; Ganguli, P. C.; Gillespie, I. E. (R. Infirm., Manchester, England). *Scand. J. Gastroenterol.* 9(8):731-734, 1974.

Plasma gastrin concentration and gastric pepsin output following insulin-induced hypoglycemia were studied to establish the reproducibility of the responses. The tests were performed twice on 13 peptic ulcer patients. Gastric secretion was collected by nasogastric tube at 15-min intervals for 3 hr, and again after i.v. insulin (0.2 U/kg). Blood samples were taken simultaneously. Peptic activity was assayed using radioiodinated human serum albumin as a tracer, plasma gastrin concentration by radioimmunoassay. Basal, peak, and 2-hr output of pepsin after insulin hypoglycemia values were reproducible (2-hr output most consistent). No significant difference was found in the data from the two tests. Values for serum gastrin concentration after insulin were widely scattered, but the overall pattern of the two tests was similar. Only the 2-hr gastrin output was found to be reproducible. The results cast doubt on the suitability of insulin as a stimulus for gastrin secretion.

3064 ACID SECRETION AND SERUM GASTRIN FOLLOWING INSULIN AND 2-DEOXY-D-GLUCOSE IN DUODENAL ULCER PATIENTS. *(E.)* Emas, S.; Svensson, S. O.; Dorner, M.; Kaess, H. (Dep. Surg. Clin. Physiol., Univ. Lund, Sweden). *Scand. J. Gastroenterol.* 9(7): 629-637, 1974.

The relationship of gastric acid response and serum gastrin concentration following insulin and 2-deoxy-D-glucose was studied in 30 patients with duodenal ulcer. Following administration of insulin (0.2 U/kg i.v.) or 2-deoxy-D-glucose (50 mg/kg i.v.) gastric secretion was collected at 15-min intervals. Serum gastrin concentration was determined by radioimmunoassay. The basal gastrin level varied but was unrelated to basal acid output or pH of the secretion. 2-Deoxy-D-glucose produced a higher peak acid response and peak gastrin level than insulin. The acid response to the stimulants was unrelated to the gastrin response. Insulin failed to increase gastrin level in three patients and 2-deoxy-D-glucose failed in one patient; both produced acid response in all patients. The absence of any relationship between gastrin level and acid secretion in the duodenal ulcer patients suggests that the acid response to insulin and 2-deoxy-D-glucose produced mainly by a vagal action on the parietal cells while gastrin exerts a permissive role.

3065 EFFECT OF ATROPINE ON INSULIN-STIMULATED GASTRIN RELEASE AND GASTRIC SECRETION OF ACID, PEPSIN, AND INTRINSIC FACTOR (IF). *(E.)* Schrumpf, E.; Vatn, M. H.; Semb, L. S. (Ulleval Univ. Hosp., Oslo, Norway). *Scand. J. Gastroenterol.* 9(7):665-669, 1974.

The effect of insulin and insulin combined with atropine on acid, pepsin, and intrinsic factor (IF) secretion was studied in duodenal ulcer patients to evaluate the cholinergic component of the insulin effect. Gastric secretion was collected for 1 hr basally and for 2 hr after insulin (0.2 IU/kg i.v.) or insulin combined with atropine (2 mg). The plasma gastrin level was determined radioimmunologically at 15-min intervals. In response to insulin, increased gastric secretion and increased plasma gastrin concentration were found. The simultaneous administration of atropine significantly reduced the secretion of acid, pepsin, and IF. Gastrin release was significantly enhanced. It is suggested that the insulin effect on acid, pepsin, and intrinsic factor secretion is cholinergic, whereas the insulin effect on gastrin release may be mediated through a non-cholinergic mechanism.

3066 PEPTIC ULCER DISEASE. *(E.)* Isenberg, J. I. (Univ. California Sch. Med., Los Angeles). *Postgrad. Med.* 57(1):163-174, 1975.

3067 ETIOLOGY AND PATHOGENESIS OF CHRONIC GASTRIC AND DUODENAL ULCER. *(Pol.)* Palasz, M. (Prov. Hosp., Warsaw, Poland). *Wiad. Lek.* 26(14): 1279-1283, 1974.

3068 PATHOGENESIS OF PEPTIC ULCER AND THE ADRENAL CORTEX. *(Rus.)* Boianovich, K. (Med. Acad., Lodz, Poland). *Klin. Med. (Mosk.)* 52(11): 38-43, 1974.

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3071 DUODENOCOLONIC FISTULA IN A PATIENT WITH A DUODENAL ULCER. *(Rus.)* Zubarchuk, S. K.; Ishuk, A. G. (no affil.). *Klin. Med. (Mosk.)* 52(7):138-139, 1974.

3072 CLINICAL AND MORPHOLOGICAL FEATURES OF GASTRIC ULCERS IN ELDERLY PATIENTS. *(Rus.)* Kodolova, I. M.; Maiorov, V. M. (All-Union Sci. Res. Inst. Gastroenterol., Moscow, USSR). *Klin. Med. (Mosk.)* 52(1):105-110, 1974.

3073 VITAMIN B_1, B_6, PP AND C BALANCE IN PATIENTS WITH PEPTIC ULCER DISEASE UNDERGOING COMBINED TREATMENT. *(Rus.)* Litinskaya, E. V. (Clin. Hosp. No. 22, Kiev, USSR). *Vrach. Delo* (12):71-75, 1974.

3074 CHANGES IN THE CONTENT OF FREE AMINO ACIDS IN THE BLOOD OF ULCER PATIENTS AS RELATED TO THE CLINICAL COURSE AND TREATMENT. *(Rus.)* Ilika, V. G. (Chernovtsy Med. Inst., USSR). *Vrach. Delo* (12):64-69, 1974.

3075 KININ SYSTEM OF THE BLOOD IN PATIENTS WITH PEPTIC ULCER. *(Rus.)* Stepanova, I. V.; Vizir, A. D. (Zaporozhe Med. Inst., USSR). *Vrach. Delo* (10):21-22, 1974.

3076 STUDIES OF THE INCIDENCE OF ANTIBODIES TO PARIETAL CELLS IN SERUM OF PATIENTS WITH CHRONIC PEPTIC ULCER. *(Pol.)* Chojnacki, J. (Acad. Med., Lodz, Poland). *Wiad. Lek.* 27(21):1853-1856, 1974.

3077 GASTRIC SECRETION IN PATIENTS WITH CHRONIC ULCER AND THE ABILITY TO SECRETE BLOOD GROUP SUBSTANCES WITH SALIVA. *(Pol.)* Chojnacki, J. (Acad. Med., Lodz, Poland). *Wiad. Lek.* 27(22):1933-1936, 1974.

3078 CHANGES IN THE ACID-PRODUCING FUNCTION OF THE OPERATED STOMACH IN PEPTIC ULCER. *(Rus.)* Savelyev, V. S.; Umbrumyants, O. A. (N. I. Pirogov 2nd Moscow Med. Inst., USSR). *Khirurgiia (Mosk.)* (2):24-29, 1974.

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3081 MEASUREMENT OF THE INTRAESOPHAGEAL pH IN PATIENTS WITH PEPTIC ULCER. *(Rus.)* Anakhsian, V. R.; Ermolov, A. S.; Kolesnikova, G. D.; Parina, M. M. (N. I. Pirogov 2nd Moscow Med. Inst., USSR). *Klin. Med. (Mosk.)* 52(11):43-47, 1974.

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3083 DUODENAL ULCERS PRODUCED BY NONSTEROIDAL ANTIINFLAMMATORY COMPOUNDS PLUS BILE DUCT LIGATION. *(E.)* Robert, A.; Nezamis, J. E.; Lancaster, C. (Dep. Exp. Biol., Upjohn Co., Kalamazoo, Mich.). *Fed. Proc.* 34(3):442, 1975.

3084 EFFECT OF DOCA ON THE DEVELOPMENT OF EXPERIMENTAL HISTAMINE GASTRIC ULCERS. *(Rus.)* Liashko, N. A.; Melnik, L. A.; Kosenko, A. F.; Kushnir, V. E. (Inst. Physiol., T. H. Shevchenko Univ., Kiev, USSR). *Vrach. Delo* (10):16-20, 1974.

3085 THE PROTECTIVE EFFECT OF VAGOTOMY AND PYLOROPLASTY ON THE INDUCTION OF STRESS ULCERS IN EXPERIMENTAL ANIMALS. *(Ger.)* Ruppell, V.; Nusser, C. J. (Surg. Clin., Univ. Wurzburg, Germany). *Z. Gastroenterol.* 12(5):307-314, 1974.

3086 EFFECT OF PEPSTATIN, A SPECIFIC PROTEASE INHIBITOR, ON THE EXPERIMENTAL PEPTIC ULCERS. *(E.)* Sung, J. L.; Chang, F. M.; Yu, J. Y. (Dep. Intern Med., Natl. Taiwan Univ., Taipei). *J. Formosan Med. Assoc.* 73(4):211-219, 1974.

3087 EFFECT OF PROLONGED ANTICHOLINERGIC TREATMENT ON GASTRIC ACID SECRETION STIMULATED BY HISTAMINE AND PENTAGASTRIN. *(Fr.)* Ligny, G. (Munic. Hosp., Charleroi, Belgium). *Agressologie* 15(2):151-164, 1974.

3088 DOUBLE-BLIND TESTS OF HYOSCIN-N-BURYLBROMIDE (BUSCOPAN) FOR ALLEVIATING PAIN IN PATIENTS WITH GASTRIC ULCERS. *(Ger.)* Sieg, H. (Munic. Hosp., Rendsburg, Germany). *Z. Gastroenterol.* 12(4):235-238, 1974.

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3091 VAGOTOMY AND DOUBLE PYLOROPLASTY FOR PEPTIC ULCER. *(E.)* Hines, J. R.; Geurkink, R. E.; Kornmesser, T. A.; Wikholm, L.; Davis, R. P. (Northwest. Univ. Med. Sch., Chicago, Ill.). *Ann. Surg.* 181(1):40-46, 1975.

3092 THE FEASIBILITY OF PREDICTING THE EFFECT OF SURGICAL VAGOTOMY. *(Rus.)* Postolov, P. M.; Naumov, B. A. (I. M. Sechenov 1st Moscow Med. Inst., USSR). *Vestn. Khir.* 113(9):138-141, 1974.

3093 EFFECT OF BENZOHEXONIUM ON GASTRIC SECRETION BEFORE AND AFTER SELECTIVE VAGOTOMY COMBINED WITH DRAINAGE AND SPARING PROCEDURES. *(Rus.)* Babichenko, M. E.; Babichenko, G. E. (Kiev Med. Inst., USSR). *Klin. Khir.* (10):9-12, 1974.

3094 ENDOSCOPIC EXAMINATION OF THE STOMACH AFTER VAGOTOMY AND PYLOROPLASTY. *(It.)* Belsasso, E.; Visintini, E.; Adovasio, R.; Caenazzo, E. (Osp. Maggiore, Trieste, Italy). *Chir. Gastroenterol.* 8(1):28-34, 1974.

3095 EXTRAGASTRIC LIBERATION OF GASTRIN IN NORMAL SUBJECTS AND PATIENTS WITH DUODENAL ULCERS OR AFTER PARTIAL STOMACH RESECTION AND BILLROTH I PROCEDURE. *(Ger.)* Hausamen, T. U.; Fritsch, W. P.; Rick, W.; Kleybrink, H.; Schacht, U. (1st Med. Clin. A., Univ. Dusseldorf, Germany). *Z. Gastroenterol.* 12(4):265-268, 1974.

3096 GASTRIC SECRETION AFTER VAGOTOMY IN CONNECTION WITH ECONOMIC GASTRIC RESECTION IN PATIENTS WITH DUODENAL ULCERS. *(Rus.)* Postolov, P. M.; Naumov, B. A.; Makarova, V. N. (I. M. Sechenov 1st Moscow Med. Inst., USSR). *Khirurgiia (Mosk.)* (2):42-47, 1974.

3097 CHANGES OF THE ELECTROCARDIOGRAM FOLLOWING SUBDIAPHRAGMATIC VAGOTOMY IN PATIENTS WITH PEPTIC ULCER. *(Rus.)* Nechiporuk, V. M.; Ryzanovskaya, V. M. (Vinnitse Med. Inst., USSR). *Vrach Delo* (11):81-83, 1974.

3098 STATE OF THE CARDIOVASCULAR SYSTEM IN PATIENTS WITH PEPTIC ULCER BEFORE AND AFTER RESECTION OF TWO-THIRDS OF THE STOMACH. *(Rus.)* Ryzhkova, K. G. (Kiev Inst. Postgrad. Med., USSR). *Vrach Delo* (12):58-60, 1974.

3099 ANTICHOLINERGICS: DO THEY WORK IN PEPTIC ULCER? *(E.)* Ivey, K. J. (R. Prince Alfred Hosp., Camperdown, Australia). *Gastroenterology* 68(1):154-166, 1975.

3100 LONG-TERM RANDOMIZED PROSPECTIVE COMPARISON OF FINNEY AND HEINEKE-MIKULICZ PYLOROPLASTY IN PATIENTS HAVING VAGOTOMY FOR PEPTIC ULCERATION. *(E.)* Thompson, B. W.; Read, R. C. (VA Hosp., Little Rock, Arkansas). *Am. J. Surg.* 129(1):78-81, 1975.

3101 SURGICAL TREATMENT OF LATE POSTGASTRECTOMY SYNDROMES. *(E.)* Reber, H. A.; Way, L. W. (Univ. California Sch. Med., San Francisco). *Am. J. Surg.* 129(1):71-77, 1975.

3102 GASTRIC ACID AND DUODENOGASTRIC REFLUX. *(E.)* Kallner, A. (Serafim Hosp., Karolinska Inst., Stockholm, Sweden). *Lancet* 1(7902):338, 1975.

3103 BLEEDING PEPTIC ULCER. *(E.)* Tandon, R. K.; Tsapogas, M. J. (Albany Med. Coll., N.Y.). *NY State J. Med.* 75(1):35-38, 1975.

3104 ACUTE GASTROINTESTINAL ULCERS AS SEQUELAE OF SURGERY: 18 CASES. *(Fr.)* Bessot, M.; Lorenzini, C.; Mauuary, G.; Ravey, M.; Voiry, J. P.; Laxenaire, M. C.; Frisch, R. (Univ. Hosp. Cent., Nancy, France). *Ann. Med. Nancy* 13:1443-1450, 1974.

3105 THE USE OF BENZOHEXONIUM IN THE TREATMENT OF POSTVAGOTOMY COMPLICATIONS. *(Rus.)* Cherniakevich, S. A.; Groisman, S. D. (N. I. Pirogov 2nd Moscow Med. Inst., USSR). *Khirurgiia (Mosk.)* (4):111-118, 1974.

See also, 2535, 2553, 2555, 2876, 2890, 2894, 2948, 2951, 2957, 2988, 2992, 2995, 3011, 3018, 3020, 3022, 3047, 3050, 3345, 3462, 3649, 3689.

SMALL INTESTINE

3106 DUODENAL DUPLICATION AND ACUTE PANCREATITIS: A RARE COMBINATION. *(Fr.)* Meyer, C.; Otteni, F.; Kohler, J. J.; Hollender, L. F. (Univ. Hosp. Cent., Strasbourg, France). *Lyon Chir.* 70(4):255-256, 1974.

At laparotomy, radiological examination of the biliary tract of a 14-yr-old girl with acute pancreatitis showed a normal common bile duct and excellent flow into the duodenum, but some of the contrast medium escaped to the left side and outlined an area inside the pancreas. A bile-filled swelling the size of an adult fist was found in the head of the pancreas. It appeared to be either a cystic diverticulum of a bile duct or a pancreatic cyst. After performing a cystoduodenostomy, histological examination of the wall of the cyst revealed a duodenal mucosa surrounded by a layer of muscle, suggesting that this cavity resulted from duodenal duplication. It is suggested that this duplication compressed the pancreatic duct. The absence of signs referable to the biliary tract can be explained by communication of the opening at the bottom of the duplication with the lower bile duct and not with the pancreatic duct. Bile flowed into the diverticulum which acted as a reservoir. The patient is alive and well 17 months after surgery.

3107 PRIMARY INTESTINAL LYMPHOMA WITH PARAPROTEINEMIA. *(E.)* Shahid, M. J.; Alami, S. Y.; Nassar, V. H.; Balikian, J. B.; Salem, A. A. (American Univ. Hosp., Beirut, Lebanon). *Cancer* 35(3):848-858, 1975.

Five of 25 cases of primary intestinal lymphoma seen at the American University Hospital in Beirut in a 4-yr period are described, 4 of which (16%) were associated with immunoglobulin (Ig) abnormality. The main clinical features included abdominal pain, diarrhea, and marked weight loss, together with radiologic and some laboratory findings suggestive of malabsorption, with low levels of serum protein, serum albumin, serum cholesterol, and often serum calcium. Laparotomy performed in 4 cases revealed dilatation of the small intestine, with mesenteric node enlargement. In these 4 instances there was a definite histologic evidence of malignant lymphoma, either initially or later in the course of the disease. A characteristic feature was the diffuse infiltration of the intestinal mucosa with plasma cells, which in the deeper layers became progressively atypical and were mixed with histiocytes and giant cells. A similar infiltrate was seen in the mesenteric nodes. Immunoelectrophoresis showed the pattern of IgA heavy chain disease. It is suggested that IgA heavy chain disease is a variant of primary intestinal lymphoma and not a separate disease entity. From these cases, it may be stated that primary intestinal lymphoma with malabsorption, as seen in the Middle Eastern countries, represents a definite entity with characteristic clinical, radiologic, and histologic features.

3108 EXTRINSIC DUODENAL OBSTRUCTION IN INFANTS AND CHILDREN. *(E.)* Tryfonas, G.; Young, D. G. (R. Hosp. Sick Child., Glasgow, Scotland). *Br. J. Surg.* 62(2):125-129, 1975.

The case records of 34 infants and children (1 day to 11 yr) admitted to hospital during a 5-yr period with signs or symptoms due to extrinsic duodenal obstruction are reviewed. All the neonates had shown signs of an upper intestinal obstruction and all had vomited bile-stained fluid. Only two infants failed to pass meconium and most had passed changed stools. All the older infants and children, except one, had normal bowel habits until the acute episode. X-rays of the abdomen in the erect posture were not always helpful in making the diagnosis. When straight x-rays did not clarify the position, radiological studies using a contrast medium were made. An abnormal but variable pattern of gas distribution throughout the gut with fluid levels in the stomach, and sometimes in the duodenum and the small bowel when volvulus had occurred, were the most common findings. In infants or children with malrotation the duodenojejunal flexure was displaced to the right and the proximal small bowel was lying predominantly on the right side of the peritoneal cavity rather than on the left. Three types of malrotation were identified: 1) malrotation with bands; 2) malrotation with volvulus of the midgut; and 3) superior mesenteric artery obstruction. All the patients in this group were considered to require operation. Five patients died, one just after admission and four during the first 24 hr after operation. The factors which interrupt the normal rotation of the gut remain obscure. In only one of the present series was a clear etiological factor present, namely, a diaphragmatic hernia. It is emphasized that speed is essential in the diagnosis of this condition because there is no external evidence to indicate which infants have volvulus and this complication may result in gangrene of the small bowel.

3109 THE ABILITY OF AN ELEMENTAL DIET TO SUPPORT NUTRITION AND ADAPTATION IN THE SHORT GUT SYNDROME. *(E.)* Voitk, A. J.; Crispin, J. S. (Dep. Surg., Univ. Manitoba, Winnipeg, Canada). *Ann. Surg.* 181(2):220-225, 1975.

The usefulness of the elemental diet in the short gut syndrome was investigated using 80 adult male Sprague-Dawley rats which had been subjected to 85% enterectomy (sufficient to cause major nutritional problems) or jejunal biopsy. After recovery, the rats in each group were randomly fed either elemental diet or rat chow. Hemoglobin, albumin, and total protein were determined at the time of operation and at sacrifice, 8 weeks later. A daily record was also kept of weight, food and water consumption, and amount and character of stool. Biopsied rats gained more weight with elemental diet than chow (22% *versus* 18%). Resection produced greater weight loss than biopsy and slower gain. The failure to gain was most marked in elemental diet rats, significantly less than in the chow group by week 2. A fall in hemoglobin, protein, and albumin was seen in all rats: neither the fall nor difference between the groups was significant. Enterectomized chow rats ate 22% more than their controls, whereas the elemental diet group ate 10% less. Increase in bowel length after resection, equally divided between jejunum and ileum, was 21% with elemental diet and 26% with chow. Gut diameter after resection increased 104% and 98% with chow and elemental diet, resp. Villus height increased 65% in the jejunum of both enterectomized groups and 85% and 78% with chow and elemental diet, resp., in the ileum. Changes in gut length, diameter and villus height were significant in each group but not between groups. It is concluded that elemental diet can support nutrition in the adaptive phase of the short gut syndrome but less well than normal food.

3110 METASTATIC SEEDING ALONG THE SMALL BOWEL MESENTERY. ROENTGEN FEATURES. *(E.)* Meyers, M. A. (New York Hosp.-Cornell Univ. Med. Cent., N.Y.). *Am. J. Roentgenol. Radium Ther. Nucl. Med.* 123(1):67-73, 1975.

The characteristic roentgen features in eight cases of proved malignant seeding along the small bowel mesentery are discussed and illustrated. The anatomic features of the small bowel mesentery and the pathways of flow of ascitic fluid along its peritoneal recesses determine the deposition and growth of seeded metastases. Seeded deposits lodge particularly within the lower recesses of the small bowel mesentery and are reflected by typical changes involving distal ileal loops or the cecum. These changes are characterized by palisading, arcuate scalloped deflections or gross mass displacement of distal small bowel loops in the right lower quadrant, or by extrinsic indentations upon the medial and inferior contours of the cecum. Associated desmoplastic reaction may result in tethering of mucosal folds and angulated fixation of bowel loops. The most extreme fibrous reaction was encountered in metastatic seeding from pancreatic carcinoma and mucin-producing gastric carcinoma. In the male, the primary carcinoma most commonly arises in the gastrointestinal tract and in the female, the genital system. It is concluded that the small bowel alterations are not difficult to distinguish from other common disease states. The lack of inflammatory features and the characteristic spectrum of changes help in the differential diagnosis from regional enteritis, tuberculosis, amebiasis, and peritoneal adhesions.

3111 ENDOSCOPIC POLYPECTOMY IN THE DUODENUM. ITS COMPLICATIONS BY PANCREATITIS. *(E.)*

Apler, E. I.; Foroozan, P.; Johnson, R. B.; Haubrich, W. S. (Scripps Clin. Res. Found., La Jolla, Calif.). *Gastrointest. Endosc.* 21(3):119-122, 1975.

The endoscopic removal of 9 of 12 duodenal polypoid lesions identified during an 18-month period is discussed. These lesions included epithelial and Brunner's gland adenomas, villous adenomas, and a carcinoid tumor. In all but one case, the lesion was first noted in upper gastrointestinal radiographs. The lesions were removed using the snare and electrocoagulation method, with intermittent current application. An attempt was made to avoid contact with the opposite duodenal wall. In two cases, the histopathological findings suggested that the procedure may have been of definite benefit. Two patients whose postbulbar adenomas were removed developed acute transient pancreatitis from which they recovered completely; their cases are presented in detail. The occurrence of acute pancreatitis in two members of this small group of patients may be cause for some hesitation with respect to future procedures. Both of these episodes involved lesions situated in the second portion of the duodenum which were endoscopically distinct and apart from the duodenal papilla. The following broad indications were drawn from this experience: 1) removal of a pedunculated lesion of the bulb which has some evidence of mucosal irregularity may be justified; and 2) masses which are submucosal and appear to be covered by normal duodenal lining might best be left alone.

3112 PANCREATIC ADAPTATION TO SUBTOTAL RESECTION OF THE SMALL INTESTINE IN INFANTS AND CHILDREN. *(Ger.)*

Niessen, K. H.; Brugmann, G.; Osswald, P.; Schmidt, K.; Flach, A. (Pediatr. Clin., Univ. Tubingen, Germany). *Klin. Wochenschr.* 52(16):796-798, 1974.

The secretin-pancreozymin test was used to study pancreatic function in 4 patients who had undergone subtotal resection of the small intestine 1 day to 1 month after birth for necrotizing enteritis (2 cases), volvulus of the small intestine (1 case), or gastroschisis (1 case). When calculated on the basis of body weight, the volume of pancreatic secretion and the bicarbonate output were increased in 2 of the 4 patients. In addition, 1 patient had an elevated trypsin output. However, when the absolute values of pancreatic secretion in these children were compared with those of 23 children of the same age who were of normal height and weight, both these values and values calculated on a body weight basis fell in the normal range. It is suggested that evidence of pancreatic hyperfunction in patients who have undergone subtotal resection of the small intestine, as in patients with celiac disease, is due to malnutrition in these children.

3113 CYTOPHOTOMETRIC AND AUTORADIOGRAPHIC STUDIES OF THE FUNDAL GLANDS OF THE GASTRIC MUCOSA AFTER EXTENSIVE RESECTION OF THE SMALL INTESTINE.

(Rus.) Zufarov, K. A.; Baibekova, E. M.; Pechnikov, L. V. (Tashkent Med. Inst., USSR). *Arkh. Anat. Gistol. Embriol.* 67(11):18-23, 1974.

Cytophotometric and autoradiographic studies were conducted on male albino rats after an extensive resection of the small intestine to measure DNA content in the nuclei of the chief and parietal cells of the fundic glands, RNA content in the cytoplasm of the chief cells, and ^{3}H-thymidine incorporation in all the epithelial cells of the gastric mucosa. The findings indicate that by the end of the first month, the pepsinogen-forming function of the fundic cells was significantly inhibited and partially replaced by mucus secretion, which was indicated by the drop in the DNA content in the cytoplasm of the chief cells by 16% and a twofold increase of the goblet cells, and decrease in the chief cells by 37%. The adaptive function was taken over by the nuclei of the chief and parietal cells of the stomach which was evidenced by an increase in the DNA content in these cells and a more active DNA synthesis in the parietal cell nuclei. Three months after the operation, enhanced DNA synthesis and proliferation of the chief cells indicated the postoperative tendency to regulate protein metabolism and rectify the deficiency of the pepsinogen secreting cells. It is suggested that resection of the small intestine involves an adaptive rearrangement resulting in enhanced synthesis of nucleic acids in the specialized cells of the fundic glands, in the increase of their number and mitotic activity.

3114 LEIOMYOMAS OF THE SMALL INTESTINE: TWO CASES DISCOVERED BY ARTERIOGRAPHY. *(Fr.)*

Labrune, M.; Brault, B.; Rey, J. L.; Chaput, J. C.; Gaux, J. C. (Antoine-Beclere Hosp., Clamart, France). *Ann. Radiol. (Paris)* 17(5):491-495, 1974.

The value of arteriography in the localization of leiomyomas of the small intestine was studied. Two patients presenting with recurrent digestive hemmorrhage showed arteriographic evidence of a benign tumor: normal or enlarged afferent artery; tumor formed from a mass of harmonious neovascularization; homogenous opacity of the parenchyma; normal afferent vein; spongy aspect to the tumor; and massive venous return when the leiomyoma is associated with an angiomatous component. In one instance, the tumor was located on the duodenum, and in the other it was located on the ileocecum. Treatment was by limited resection. Surgical exploration is necessary to determine the specific histologic type. Because the tumors tend to develop outside the intestinal lumen, barium opacification may produce normal appearance, although there may be signs of extrinsic compression, as in one of the observed cases. It is concluded that only arteriography can reveal the existence and position of these hypervascular tumors.

3115 THE ROENTGENOLOGIC SPECTRUM OF SMALL INTESTINAL CARCINOID TUMORS. *(E.)* Bancks, N. H.; Goldstein, H. M.; Dodd, G. D., Jr. (Univ. Texas Med. Sch., Houston). *Am. J. Roentgenol. Radium Ther. Nucl. Med.* 123(2):274-280, 1975.

The roentgenologic features of 18 small intestinal carcinoid tumors were analyzed. The patients, 8 of whom were female, ranged in age from 40-69 yr. The primary neoplasm arose in the ileum in 17 cases and in the jejunum in 1 case. The most common clinical symptom was crampy abdominal pain generally associated with some degree of intestinal obstruction. Roentgenologic appearances varied from solitary or multiple submucosal nodules to extensive mesenteric desmoplasia without demonstration of a tumor mass. Some manifestation of the desmoplastic reaction was observed in at least 13 patients. The spectrum of roentgenologic features secondary to carcinoid tumors was more diverse than with most gastrointestinal neoplasms, primarily because of the variety of growth patterns and the tissue reactions incited by this disease. Thus, carcinoid tumors should be considered in the differential diagnosis of both inflammatory and neoplastic small bowel lesions. In particular, when there is evidence of solitary or multiple submucosal nodules and/or when manifestations of mesenteric disease are present, carcinoid tumor is a likely diagnosis. Angiographically, the most common features of carcinoid tumors are kinking, irregularity, or obstruction of distal intra-mesenteric arteries. Careful small intestinal examination is essential, since a barium study often provides the first or only opportunity to suggest diagnosis. Moreover, prognosis appears to be directly correlated with the tumor size and resectability, and preoperative consideration of the diagnosis is important for safe anesthesia in patients with elevated vasoactive hormonal levels.

3116 DUODENAL PSEUDOPOLYP - THE FLEXURE FALLACY. *(E.)* Nelson, J. A.; Sheft, D. J.; Minagi, H.; Ferruci, J. T., Jr. (VA Hosp., San Francisco, Calif.). *Am. J. Roentgenol. Radium Ther. Nucl. Med.* 123(2):262-267, 1975.

Several patients with a persistent roentgenographic contour defect at the superior flexure of the duodenum were surgically studied and followed for periods of 6 months to 15 yr. The typical finding was a characteristic filling defect with prominent folds in the duodenal bulb and no evidence of ulcer or mucosal erosion; the descending duodenum was normal. The explanation of the phenomenon appeared to be a heaping up of redundant loose mucosa on the inner aspect of the duodenal flexure; as the tubular muscle wall of the gut turned, the outer mucosa was stretched while the inner folds at the flexure were compressed and piled up. The phenomenon appeared to be both benign and rather common, occurring in males and females within a broad range of ages. Radiologists should become aware of this change, because it is so characteristic in location and appearance that further, more aggressive diagnostic work-up seems unwarranted.

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See also, 2818, 2881, 2886, 2896, 2897, 2943, 2944, 2959, 2964, 3012, 3050, 3058, 3071, 3083, 3197, 3198, 3199, 3247, 3277, 3282, 3294, 3295, 3371, 3554, 3601, 3615, 3636, 3651, 3658, 3667, 3671, 3672, 3674, 3676, 3677, 3679, 3685, 3719, 3745, 3748, 3760, 3782.

SMALL INTESTINE

Malabsorption

3176 INCIDENCE OF CELIAC DISEASE. *(Fr.)* Bernier, J. J.; Bourdeloux, J. J. (St. Lazare Hosp., Paris, France). *Arch. Fr. Mal. App. Dig.* 63:361-364, 1974.

Celiac disease has been diagnosed in 90 adults and 299 children less than 15 yr old who were born in the Paris area between 1882 and 1972; 32% were males and 68% females. In all of these cases, diagnosis was confirmed by intestinal biopsies and regression of the disease after institution of a gluten-free diet. In the Paris area there is 1 case/75,000 adult inhabitants attending the hospitals in this study. Among children, the incidence was 1 case/5454 children living in Paris and 1 case/4138 children living in the Paris area. A more detailed study of children born in 1970-1972 who developed celiac disease before age 2 yr, showed 1 case/2500 births in the Paris area. Among North Africans, mostly Algerians, living in Paris, the incidence was much higher (1 case/250 children less than 15 yr old). An apparent increase in the incidence of celiac disease in children born between 1960 and 1968 and those born between 1970 and 1972 may be due to a difference in the incidence of symptomatic and asymptomatic forms.

3177 BILE ACID MALABSORPTION IN CHILDREN WITHOUT INTESTINAL RESECTIONS. *(Fr.)* Weber, A.; Roy, C. C.; Chartrand, L.; Morin, C. L.; van Caillie, M. (St. Justine Hosp., Montreal, Canada). *Union Med. Can.* 103(12):2089-2094, 1974.

Fecal lipids and bile acids were measured in 72-hr stool specimens from 87 children with a variety of gastrointestinal disorders and 18 controls. None of the patients had a history of hepatobiliary disease or intestinal resection. Bile acid malabsorption was detected in 1 of 6 children with Crohn's disease, 2 of 8 with refractory diarrhea, 3 of 4 with chronic specific diarrhea (2 with salmonellosis and 2 with giardiasis), all of 4 with bacterial contamination of the upper intestine due to intestinal stasis, and all of 36 patients with cystic fibrosis. No evidence of bile acid malabsorption was found in 16 children with celiac disease or 7 with irritable colon. These findings differ from those reported in the literature on adults with Crohn's disease and irritable colon. Intestinal transit was decreased to a comparable extent in children with irritable colon, celiac disease, and cystic fibrosis, although fecal excretion of bile acids was not increased in irritable colon or celiac disease. Thus, increased fecal bile acid contents cannot be explained by increased transit times in cystic fibrosis.

3178 STENOSIS OF THE SMALL INTESTINE ASSOCIATED WITH STAGNANT LOOP SYNDROME AND MALABSORPTION. *(Fr.)* Hurtubise, M.; Emond, M.; Rousseau, B. (Notre Dame Hosp., Montreal, Canada). *J. Can. Assoc. Radiol.* 25(3):227-233, 1974.

Case reports are presented for 3 patients with stagnant loop syndrome and malabsorption. A 50-yr-old woman who had undergone 2 ileotransversostomies over a 23-yr period for Crohn's disease developed malabsorption and steatorrhea. X-rays showed distension of the small intestine above the anastomosis. A 15-yr-old boy with a 1-yr history of diarrhea presented with growth retardation, ascites, edema of the lower extremities, and edematous infiltration of the abdominal wall. Laboratory investigations revealed severe malabsorption, steatorrhea, and severe hypoproteinemia. X-rays showed distension of about 100 cm of proximal small intestine which was 10 cm in diameter in the most severely affected part. At laparotomy, a stenotic segment of small intestine, about 35 cm long, was found below the distended segment. On the basis of ulcerations, epithelioid follicles, and occasional polynuclear eosinophils in this stenotic segment, a diagnosis of Crohn's disease was established, but sarcoidosis is also possible due to the presence of Schumann bodies. After removal of stenotic intestine, the patient showed marked improvement: malabsorption disappeared and he gained in weight and stature. A 21-yr old man with a 7-yr history of diarrhea presented with marked growth retardation and malabsorption. Laparotomy showed volvulus of the last loop of the small intestine around an adhesion, with traction being exerted between the cecum and last loop of the small intestine. Adhesions were removed, but the patient's recovery was complicated by a greatly distended loop of small intestine which showed no evidence of mechanical obstruction. The patient gradually improved after this was removed. Three biopsies of this small intestine ruled out the possibility of aganglionosis.

3179 ASSESSMENT OF SMALL BOWEL FUNCTION IN THE ELDERLY USING A MODIFIED XYLOSE TOLERANCE TEST. *(E.)* Webster, S. G. P.; Leeming, J. T. (Chesterton Hosp., Cambridge, England). *Gut* 16(2):109-113, 1975.

Small bowel function was measured in 85 elderly patients (63-95 yr old, mean age 81) irrespective of renal function by determining the ratio between the amount of xylose recovered in the urine after a p.o. dose and the amount recovered after i.v. administration. No patients with small bowel disease or suggestive symptoms were included nor were those with a diagnosed noeplastic lesion or ascites. A younger group ranging in age from 18-35 yr was also studied. Subjects were fasted for at least 8 hr after which they were given 25 g of d-xylose in 200 ml water p.o. or 5 g of xylose in a 10% solution injected slowly i.v. over 2-3 min. Urine was collected for 5 hr after xylose administration, the total volume measured, and analyzed for xylose. In 69 elderly patients without catheters, 5-hr urinary xylose recovery after the p.o. dose ranged from 0.1-7.3 g and after the i.v. dose ranged from 0.4-2.5 g. In 16 elderly patients with catheters, 5-hr urinary xylose recovery after the p.o. dose ranged from 0.7-6.5 g and after the i.v. dose from 0.5-2.4 g. Corresponding values in the 20 young controls were 3.7-9.0 g after the p.o. dose and 1.1-2.7 after i.v. administration. These findings indicate that the absorption of d-xylose from the small bowel is impaired in old age. The ability to absorb xylose was very variable in the aged subjects but 26% of those elderly subjects studied had a xylose test absorption ratio below the calculated normal range of the young subjects. In a previously published report it was concluded that absorption of xylose was not impaired in the elderly. There are two possible explanations for the difference between the earlier results and those reported in this paper: 1) the first group was younger than the group studied in the present report; and 2) no dietary restrictions were imposed on subjects undergoing the i.v. test in the previously reported study. It is concluded that poor renal function, incomplete bladder emptying, and altered gastric emptying are not possible causes for the differences between the two age groups.

3180 COMPUTER CARD MORPHOMETRY OF JEJUNAL BIOPSIES IN CHILDHOOD COELIAC DISEASE. *(E.)* Meinhard, E. A.; Wadbrook, D. G.; Risdon, R. A. (R. Free Hosp., London, England). *J. Clin. Pathol.* 28(2):85-93, 1975.

Histological changes in 95 jejunal biopsy specimens from children have been analyzed by a new morphometric technique. The microscope image of the specimen is traced directly onto computer data cards. A simple sketch records accurate quantitative data in a matrix of 840 points, retaining the spatial arrangement of the tissue components. Data are fed, *via* an optical mark data card reader, into a mini-computer. FORTRAN IV programs allow calculation of surface area, villous heights, and component volumes in metric units, and of volume proportions, volume:volume ratios, and surface:volume ratios. Pictorial and numerical printouts are produced, which are suitable for inclusion in the patient's notes. Jejunal biopsies from 37 controls and 26 untreated celiac patients were clearly distinguished morphometrically. Untreated celiac mucosae were flat; the surface area fell from a control value of 3.13 mm^2/mm^2 muscularis mucosae to 1.13 mm^2/mm^2 muscularis mucosae. The surface epithelial volume fell from 0.16 mm^3/mm^2 (or 34% of total mucosal volume) to 0.03 mm^3/mm^2 muscularis mucosae (or 8% of the total mucosal volume). The cumulative villus height fell similarly from 2942 μ to 50 μ. The crypt volume rose significantly in untreated celiac mucosa from control volume of 0.09 mm^3/mm^2 (21% of total mucosal volume) to 0.17 mm^3/mm^2 muscularis mucosae (39% total mucosal volume). The ratio of surface epithelial volume to crypt volume fell significantly from 1.74 in controls to 0.21 in untreated celiacs. The volumes of surface-related and crypt-related lamina propria show a pattern of changes similar to their respective epithelial components. When on a gluten-free diet, treated celiac children show few differences from controls. A return of dietary gluten causes a reversion of the results towards those of the untreated celiac group. It is noted however, that the total mucosal volume does not differ between the groups, suggesting that the mucosal lesion in celiac disease is not a true atrophy.

3181 IRON DEFICIENCY ANEMIA AND MALABSORPTION. *(Ger.)* Vetrella, M.; De Masi, V.; Tancredi,

F. (Santa Annunziata Hosp., Naples, Italy). *Monatschr. Kinderheilk.* 122(7):562-564, 1974.

Eight patients, aged 12-36 months, with iron-deficiency anemia and symptoms of intestinal malabsorption (diarrhea, pathological xylose-test, pathological test for fecal fat) were treated with parenteral doses of iron along with an otherwise unrestricted diet. A peroral biopsy showed partial to total atrophy of the mucosa in the small intestine of 7 of these 8 patients. Within 4 to 12 days after institution of parenteral treatment with iron, diarrhea ended; hematological parameters normalized within 3 weeks. The fat excretion normalized within 10 days to 4 months and the xylose test, within 1 to 2 months. The peroral biopses were normal 6 months after institution of treatment.

3182 CORRECTION OF THE MALABSORPTION OF THE PRETERM INFANT WITH A MEDIUM-CHAIN TRIGLYCERIDE FORMULA.

(E.) Roy, C. C.; Ste-Marie, M.; Chartrand, L.; Weber, A.; Bard, H.; Doray, B. (Sainte-Justine Hosp., Montreal, Canada). *J. Pediatr.* 86(3): 446-450, 1975.

The extent of fat malabsorption in preterm infants fed long-chain triglyceride diets and the effects of a medium-chain triglyceride formula on the steatorrhea and resultant caloric deficiency were investigated in 25 preterm infants weighing 1,300-1,800 g. After receiving a milk-based formula for 1 week, 16 infants were fed 2 isocaloric formulas containing either medium-chain or long-chain triglycerides for 15 days. The alternate formula was given for a second period of identical duration. In the second part of the study, 9 infants were given medium-chain triglycerides, and long-chain triglycerides in which the chloride concentration was that of the medium-chain triglyceride diet (21 mEq/liter). Nitrogen was measured in aliquots of formula, urine, and stools by the micro Kjeldahl method. Stool fat was determined by a technique which quantitatively extracted medium- and long-chain fatty acids. The assay of bile acids in feces was performed by a modification of the enzymatic method. Serum base excess, pH, total CO_2, sodium, potassium and chloride were also measured. While receiving the medium-chain triglyceride diet, the infants had greater percent fat absorption, as compared to 83.4% with the long-chain triglycerides (97.1%) and weight gain, 11.5 g/kg/100 calories and 7.5 g/kg/100 calories, resp. It is concluded that this study confirms both the presence of fat malabsorption in premature infants and the beneficial effects of a medium-chain triglyceride diet.

3183 THE EFFECT OF CHOLESTYRAMINE ON INTESTINAL ABSORPTION.

(E.) West, R. J.; Lloyd, J. K. (Inst. Child Health, London, England). *Gut* 16(2): 93-98, 1975.

The effect of long-term treatment with cholestyramine on the absorption of fat, vitamins, and some minerals was studied in children with familial hypercholesterolemia. Eighteen children were treated with cholestyramine (0.6 g/kg/day) for 1-2 1/2 yr, during which time various biochemical determinations were made. In patients treated for over 1 yr, the mean serum folate concentration decreased from 7.7 ng/ml to 4.4 ng/ml; a corresponding lowering of red cell folate was also observed. Oral folic acid (5 mg/day) overcame the deficiency. Prothrombin time remained normal in all patients. There was a significant decrease in the serum concentrations of vitamins A and E and of inorganic phosphorus over the first 2 yr of treatment, although the values remained within the normal range. Concentrations of serum iron, vitamin B_{12}, plasma calcium, and protein did not change significantly. Five of seven children eating normal diets had fecal fat of over 5 g/day while on cholestyramine; none had diarrhea or weight loss. There was no consistent relationship between dosage and fecal fat. The results of the study show no evidence that cholestyramine impairs absorption of iron or vitamin B_{12}, and the normal growth rate in children and the maintenance of plasma protein concentration provide further evidence of the safety of prolonged administration of cholestyramine.

3184 PTEROLYGLUTAMIC ACID MALABSORPTION IN TROPICAL SPRUE.

(E.) Corcino, J. J.; Coll, G.; Klipstein, F. A. (Univ. (Dist.) Hosp., San Juan, Puerto Rico). *Blood* 45(4):577-580, 1975.

Pteroylglutamic acid absorption was assessed in 10 untreated tropical sprue (20-62 yr old) and 8 control subjects using a marker perfusion technique. After an overnight fast, the subjects were perfused with an isosmotic solution containing 25 ng/ml of crystalline pteroylglutamic acid with either mannitol or glucose at a concentration of 55.6 mM and a pH of 7.2. Perfusion rate was 9.2 ml/min. Each subject was perfused on 2 consecutive days. Polyethylene glycol was used as a nonabsorbable marker. Pteroylglutamic acid was measured microbiologically using *Streptococcus fecalis*. Absorption of pteroylglutamic acid was 47.3% and 28.1% for the controls and tropical sprue patients, resp., using the mannitol solution. There was considerable overlap between % pteroylglutamic acid absorbed by both groups. When the same subjects were perfused with the glucose solution, pteroylglutamic acid absorption was 58.8% and 9.8% for the controls and tropical sprue patients, resp. A clear-cut separation was observed between both groups with differences in absorption significant to the $p<0.001$ level. These results confirm those of a previous study using marker perfusion techniques and indicate, in a larger number of subjects, that malabsorption of physiologic doses of pteroylglutamic acid is demonstrable in all subjects with tropical sprue when the appropriate techniques are used.

3185 SUBEPITHELIAL COLLAGEN IN INTESTINAL MALABSORPTION.

(E.) Bossart, R.; Henry, K.; Booth, C. C.; Doe, W. F. (R. Postgrad. Med. Sch., London, England). *Gut* 16(1):18-22, 1975.

Intestinal biopsies from 146 patients with adult celiac disease and 13 patients with intestinal villous atrophy of different etiology (seven with tropical sprue, four with Whipple's disease, one with hypogammaglobulinemia, and one with strongyloidiasis) were assessed for the presence of subepithelial collagen and compared with 20 controls. All sections were stained with hematoxylin and eosin and with hematoxylin van Gieson. A grading system was devised to assess the presence and amount of subepithelial collagen: grade 1, stainable collagen either absent or confined to the vicinity of the basement membrane; grade 2, a definite zone of subepithelial collagen which involved the subepithelial vessels, and which resulted in a thickened linear staining pattern; and grade 3, a thick irregular collagen band which extended into the lamina propria to variable depths. The amount of stainable collagen in biopsies from control subjects never exceeded grade 1. In 94 of 146 patients with adult celiac disease (64%), the biopsies also showed grade 1 staining. Forty-one patients, (28%) however, showed a grade 2 staining pattern and 11 (8%) showed grade 3. Grade 2 staining was seen in the biopsies from two tropical sprue patients and grade 3 in a third. The tendency of the epithelial layer to strip off over collagen bands and the focal nature of the fibrotic process even within a single biopsy were conspicuous histological features. The effect of treatment with a gluten-free diet was studied in follow-up jejunal biopsies of 51 adult celiac patients who had taken the diet for at least 6 months. In most cases the subepithelial changes regressed following treatment but no improvement occurred in three patients whose pre-treatment biopsies showed grade 3 changes despite prolonged gluten withdrawal. Two of these three patients died of unremitting malabsorption. The results of this study confirm that collagenous subepithelial thickening, sometimes extending deeply into the lamina propria of jejunal biopsies, is a common finding of adult celiac disease. Identical changes, however, were seen in biopsies from tropical sprue patients. Subepithelial collagen, therefore, is a non-specific finding probably related to an inflammatory reaction occurring in the region of the basement membrane.

3186 ENDOCRINE CELLS IN THE HUMAN JEJUNAL MUCOSA IN NORMAL SUBJECTS AND PATIENTS WITH CELIAC SPRUE.

(Cz.) Lojda, Z.; Fric, P. (1st Inst. Pathol. Anat., Charles Univ., Prague, Czechoslovakia). *Cesk. Gastroenterol. Vyz.* 28(1):1-10, 1974.

Peroral biopsies of the jejunal mucosa, obtained from 15 patients with celiac disease and 12 normal subjects, were examined under the electron microscope and with a variety of histochemical tests. On the basis of the size and shape of the granules they contained, endocrine cells were classified into four groups. Enterochromaffin (EC) cells, which constituted more than half of the endocrine cells, had very dense, polymorphic granules measuring 200-600 nm. L-cells were the second most common type; their granules were large (200-400 nm) and round and were somewhat less dense than granules in EC-cells. S-cells were not found as often and contained small (100-250 nm) round granules; in some cases, it was impossible to differentiate S-cells from L-cells. D-cells were present in small numbers in only three biopsies and contained round granules, measuring 300-400 nm, of low density which resembled granules in the D-cells in the islands of Langerhans. All four types of endocrine cells were found in contact with the intestinal lumen. The free surface of these cells were always equipped with microvilli which were smaller than those of the enterocytes and a poorly developed glycocalyx. The presence of pinocytotic vacuoles below the microvilli indicates that the surface from which microvilli project is involved in the absorption of material from the intestinal lumen. EC-cells could be differentiated from other endocrine cells by histochemical methods on material fixed with formol or glutaraldehyde, while L-, S-, and D-cells could be detected on frozen sections of unfixed tissue. Biopsies from six patients with celiac disease contained larger than normal numbers of both EC- and L-cells. Endocrine cells more often bordered the lumen than in biopsies from normal subjects. Vacuoles, the size of which corresponded to those of specific granules, were present in larger than normal numbers, particularly in L-cells. This finding is interpreted as an increase in the release of the contents of these granules. Emiocytosis was not observed in any type of endocrine cell, either in normal subjects or in patients with celiac disease.

3187 ENZYME ACTIVITIES AND PROPERTIES OF LYSOSOMES AND BRUSH BORDERS IN JEJUNAL BIOPSIES FROM CONTROL SUBJECTS AND PATIENTS WITH COELIAC DISEASE.

(E.) Peters, T. J.; Heath, J. R.; Wansbrough-Jones, M. H.; Doe, W. F. (R. Postgrad. Med. Sch., London, England). *Clin. Sci. Mol. Med.* 48(4): 259-267, 1975.

The properties and enzymic activities of lysosomes in normal human intestinal mucosa and in mucosa from patients with untreated and treated (by dietary gluten withdrawal) celiac disease were studied. All 4 brush border enzymes (leucyl β-naphthylamidase, alkaline phosphatase, β-galactosidase, and α-glucosidase) were significantly depressed in the jejunal biopsy specimens from the untreated celiac disease patients; the decrease was particularly striking for brush-border β-galactosidase. In the treated celiac group, the enzyme activities returned toward normal values, paralleling morphological and functional improvement. The mean activities of *N*-acetyl-β-glucosaminidase, β-galactosidase, acid phosphatase, acid diesterase, acid-β-galactosidase, and β-glucuronidase were significantly increased in the untreated celiac patients, the activities decreasing toward normal values in the treated patients. The cytosol enzyme lactate dehydrogenase showed a significant decrease in the untreated celiac mucosa with a return to normal activity after treatment. Measurement of brush-border integrity by differential centrifugation of biopsy extracts indicated increased fragility of the brush borders in the untreated patients; the treated patients showed normal values. Assessment of lysosomal integrity by assay of latent *N*-acetyl-β-glucosaminidase and the sedimentable activity of 4 acid hydrolases demonstrated increased lysosomal fragility in the untreated celiac mucosa and normal values in the biopsies from the treated patients. The results indicate that the microvilli of celiac enterocytes are more fragile than normal, that the lysosomes play a role in the pathogenesis of the enterocyte damage in celiac disease, and that the pathogenesis of the disease is related to a toxic effect of gluten or an immunological mechanism.

3188 EFFECT OF PANCREATIN ON VITAMIN B$_{12}$ MALABSORPTION IN PATIENTS WITH TOTAL PANCREATECTOMY. *(E.)* Morishita, R.; Fujii, M.; Yamamoto, T.; Wakisaka, G.; Matsumoto, Y.; Ono, H. (Kyoto Univ. Sch. Med., Japan). *Digestion* 11(3/4):240-248, 1974.

The effect of pancreatin on vitamin B$_{12}$ absorption was studied in 3 patients who had undergone total pancreatectomy for cancer, 3 patients who had undergone partial pancreatectomy (1 in which the stomach was totally extirpated), and 1 patient with pernicious anemia. B$_{12}$ absorption was measured using a whole body spectrometer before, 35 min after, and 7 days after the oral administration of 0.2-0.3 μg ^{60}Co-B$_{12}$ (specific activity 0.73-0.8 or 2-3 μCi/μg). Marked B$_{12}$ malabsorption was observed in all patients who had undergone total pancreatectomy, the patient who had undergone total gastrectomy and partial pancreatectomy, and the patient with pernicious anemia. B$_{12}$ absorption was normal or somewhat depressed in the other 2 cases of partial pancreatectomy. In 2 cases of total pancreatectomy, administration of 12 g pancreatin markedly improved B$_{12}$ absorption. In the third case, pancreatin in conjunction with normal human gastric juice brought about a marked improvement in B$_{12}$ retention; the gastric juice in this patient revealed achlorhydria. Pancreatin did not enhance B$_{12}$ absorption in the partial gastrectomy or pernicious anemia patients. The beneficial effect of pancreatin on B$_{12}$ absorption in the total pancreatectomy cases was reduced by heating at 100 C for 10 min. B$_{12}$ retention in the 2 cases of partial pancreatectomy was decreased by pancreatin administration. Fat absorption was improved by the administration of small amounts of pancreatic enzymes in 2 cases of total pancreatectomy, 1 of which had not shown improved B$_{12}$ absorption after pancreatin alone. Exocrine secretions of the pancreas were severely inpaired in the patients with pancreatic disorders. The results do not clarify the mechanism by which pancreatic extract improves B$_{12}$ absorption in patients with exocrine pancreatic insufficiency.

3189 THE ROENTGENOGRAPHIC AND CLINICAL FINDINGS IN WHIPPLE'S DISEASE: A REVIEW OF 8 PATIENTS. *(E.)* Philips, R. L., Carlson, H. C. (Mayo Clin., Rochester, Minn.). *Am. J. Roentgenol. Radium Ther. Nucl. Med.* 123(2):268-273, 1975.

The clinical and roentgenographic findings in 8 patients (6 men and 2 women; average age at diagnosis 53 yr) with Whipple's disease are reported. Seven patients had abnormal roentgenograms with coarse folds and slight dilatation of the small bowel. Measurement of the mucosal folds and jejunal and duodenal width indicated thickening. The eighth patient showed no roentgenographic abnormalities. All patients had watery diarrhea and had undergone weight loss, and arthralgia was present in 7 cases. There were few physical signs, but lymphadenopathy, pigmentation, perifollicular purpura, and/or edema were present in some patients. All patients had decreased levels of serum albumin and 7 had excessive losses of fat in the stool. Periodic acid-Schiff positive macrophages in the cytoplams of the jejunal mucosa were invariably present on biopsy. All patients were treated with tetracycline (250 mg 4 times/day), which resulted in slow but steady improvement. All repeat roentgenograms and biopsy specimens showed evidence of improvement in the small bowel. The roentgenographic findings in Whipple's disease are nonspecific and resemble those of other causes of malabsorption. Positive identification of the disease is probably not possible roentgenographically, small bowel biopsy being necessary to confirm its presence.

3190 A FAMILY STUDY OF COELIAC DISEASE. *(E.)* David, T. J.; Ajdukiewicz, A. B. (Bristol Gen. Hosp., England). *J. Med. Genet.* 12(1):79-82, 1975.

The genetic mechanisms involved in the hereditary transmission of celiac disease were investigated in a family study of 141 cases on biopsy proven celiac disease in southwestern England. Thirteen patients (9%) had a positive family history of celiac disease involving a total of 21 affected relatives. Of the 13 cases with a positive family history, 4 were children. In 5 families, only a parent and child were affected, and vertical transmission through 3 generations was seen in a 6th family. In 5 additional families, only 2 sibs were affected; 4 of the sib pairs were of the same sex and there was one concordant set of monozygotic female twins. Of the 141 cases originally studied, 95 were female; the preponderance of females was absent among the childhood cases, but 99% of the adults were female. The pattern of inheritance in the 13 families with repeated celiac disease is compatible with an autosomal dominant gene with incomplete penetrance. However, other possibilities are not ruled out; a common recessive gene requiring an environmental factor for the disease to appear in homozygotes; polygenic or multifactorial inheritance; or multiple causation with forms inherited in various ways.

3191 MALABSORPTION SYNDROME ASSOCIATED WITH HUMORAL IMMUNE DEFICIENCIES. *(Ger.)* Bolte, J. P.; Hopf, U.; Knolle, J.; Olbermann, M.; Meyer zum Buschenfelde, K. H. (2nd Med. Clin., Univ. Mainz, Germany). *Z. Gastroenterol.* 12(Suppl.):430-431, 1974.

3192 NIGHT BLINDNESS IN THE BLIND LOOP SYNDROME FOLLOWING GASTROJEJUNOSTOMY. *(E.)* Levy, N. S.; Toskes, P. P. (VA Hosp., Gainesville, Fla.). *J. Abdom. Surg.* 17(1):20-25, 1975.

3193 THE IMPLICATIONS OF LACTOSE INTOLERANCE IN CHILDREN. *(E.)* Jones, D. V.; Latham, M. C. (Dep. Nutr., Cornell Univ., Ithaca, N.Y.). *Environ. Child Health* 20(5):261-271, 1974.

3194 FAT MALABSORPTION ASSOCIATED WITH BACTERIAL COLONIZATION OF A COLON TRANSPLANT: A CASE REPORT. *(E.)* Mallinson, C. N.; Drasar, B. S.; Trounce, J. R. (Greenwich Hosp., London, England). *Guys Hosp. Rep.* 122(3/4):231-244, 1973.

3195 INTESTINAL ABSORPTION AND IRON DEFICIENCY. *(Sp.)* Garcia Cobo, M. C.; De Castro del Pozo, S.; Fernandez-Renedo, A.; Herreros Fernandez, V. (Fac. Med., Valladolid, Spain). *Sangre* 19(1):22-29, 1974.

3196 POSTTRAUMATIC GASTROINTESTINAL MALABSORPTION. *(Fr.)* Richard, A. (Henri Mondor Hosp., Creteil, France). *Ann. Anesthesiol. Fr.* 15 (Suppl. 1):18-22, 1974.

3197 SURVIVAL IN GOOD HEALTH FOR 21 YEARS AFTER REMOVAL OF ALL BUT EIGHTEEN INCHES OF THE SMALL INTESTINE. *(E.)* Mallinson, C. N.; Merivale, W. H. H. (Greenwich Hosp., London, England). *Guys Hosp. Rep.* 122(384):269-298, 1973.

3198 MEGALOBLASTIC ANEMIA FOLLOWING ESOPHAGOJEJUNOSTOMY AND TOTAL GASTRECTOMY. *(Ser.)* Stefanovic, S.; Papo, I.; Protic-Hlushichka, D.; Antic, M.; Kalanovic-Kangrga, R.; Rodic, S.; Veljovic, R.; Shobic, P.; Cholovic, M. (Med. Fac., Univ. Belgrade, Yugoslavia). *Srp. Arh. Celokup. Lek.* 102(1):1-7, 1974.

3199 MASTOCYTOSIS IN THE INTESTINAL TRACT. *(Ger.)* Bartelheimer, W; Lux, G; Ottenjann, R; Elster, K. (Neuperlach Munic. Hosp., Munich, Germany). *Z. Gastorenterol.* 12(8):608-609, 1974.

3200 MALABSORPTION: PATHOGENESIS AND PATHOLOGICAL ANATOMY. *(Ger.)* Becker, V. (Pathol. Inst., Univ. Erlangen-Nuremberg, Erlangen, Germany). *Z. Gastroenterol.* 13(Suppl.): 189-209, 1975.

3201 IMPAIRED ABSORPTION AND LOSS OF BILE ACID FOLLOWING SURGERY ON THE SMALL INTESTINE IN CHILDREN. *(Ger.)* Holschneider, A. M.; Harms, K.; Boehne, A.; Bidlingmaier, F.; Dewald, M. B. (Pediatr. Clin., Univ. Munich, Germany). *Bruns Beitr. Klin. Chir.* 221(7):516-524, 1974.

3202 LACTOSE TOLERANCE IN MEXICAN AMERICAN CHILDREN. *(E.)* Woteki, C. E.; Weser, E.; Young, E. A. (Univ. Texas Health Sci. Cent., San Antonio). *Am. J. Clin. Nutr.* 28(4):433, 1975.

3203 STUDY OF PALMITATE INCORPORATION INTO THE HUMAN INTESTINAL MUCOSA. *(Fr.)* Sueur, R.; Cerf, M.; di Costanzo, G.; Debray, C. (Dent. Fac., Montrouge, France). *Biol. Gastroenterol. (Paris)* 7 (4):305, 1974.

3204 SMALL INTESTINAL MUCOSA IN COW'S MILK ALLERGY. *(E.)* Kilby, A.; Walker-Smith, J. A.; Wood, C. B. S. (Queen Elizabeth Hosp. Child., London, England). *Lancet* 1(7905):531, 1975.

3205 STUDIES OF CALCIUM METABOLISM IN LACTASE DEFICIENCY IN MAN. *(E.)* Spencer, H,; Kramer, L.; Norris, C. (VA Hosp., Hines, Ill.). *Am. J. Clin. Nutr.* 28(4):431, 1975.

3206 THE INCIDENCE AND APPEARANCE OF METABOLIC BONE DISEASE IN NON TROPICAL SPRUE. *(E.)* French, A. B.; Garn, S. M.; Poznanski, A. K. (Dep. Intern. Med., Univ. Michigan, Ann Arbor). *Am. J. Clin. Nutr.* 28(4):424, 1975.

3207 JEJUNAL HYDROLYSIS AND UPTAKE OF CONJUGATED FOLATE IN TROPICAL SPRUE. *(E.)* Halsted, C. H.; Reisenauer, A. M.; Corcino, J. J.(Dep. Med., Univ. California, Davis). *Am. J. Clin. Nutr.* 28(4): 418, 1975.

3208 SYMPTOM RESPONSE TO LACTOSE REDUCED MILK IN LACTOSE INTOLERANT ADULTS. *(E.)* Jones, D. V.; Latham, M. C.; Kosikowski, F. V.; Woodward, G. (Div. Nutr. Sci., Cornell Univ., Ithaca, N.Y.). *Fed. Proc.* 34(3):930, 1975.

3209 ABSENCE OF THE SUCROSE-ISOMALTASE COMPLEX IN SUCROSE TOLERANCE. *(Fr.)* Schmitz, J. (Hosp. Sick Child., Paris, France). *Biol. Gastroenterol. (Paris)* 7(4):313, 1974.

3210 DISACCHARIDE MALABSORPTION IN THE ESKIMOS IN GREENLAND: RESULTS FROM CLINICAL, ENZYMATIC, AND ABSORPTION STUDIES. *(Ger.)* Gudmand-Hoyer, E. (Gentofte Hosp., Hellerup, Denmark). *Z. Gastroenterol.* 13(Suppl.):244-250, 1975.

See also, 2439, 2818, 2819, 2864, 2898, 3055, 3157, 3169, 3258, 3303, 3660, 3666, 3740.

3211 AN INVESTIGATION INTO THE ENZYME HISTOCHEMISTRY OF ADENOCARCINOMAS OF HUMAN LARGE INTESTINE AND OF THE TRANSITIONAL EPITHELIUM IMMEDIATELY ADJACENT TO THEM. *(E.)* Marsden, J. R.; Dawson, I. M. P. (Dep. Pathol., Univ. Nottingham, England). *Gut* 15(10):783-787, 1974.

The enzyme histochemical patterns of normal colon, colonic adenocarcinoma, and the mucosa immediately adjacent to a carcinoma were studied to determine enzymatic changes in the adjacent epithelium, which might differ from those in the carcinoma and the more distant normal mucosa. Samples of the tissues were prepared for microscopic examination and stained using specific enzyme techniques; the enzymes were quantitated visually according to their depth of staining. Monoamine oxidase activity was moderate in normal mucosa, high in transitional mucosa, and low in carcinoma. Succinate dehydrogenase activity was high in transitional mucosa and low or moderate in normal and carcinomatous mucosa. Glucose-6-phosphate dehydrogenase activity showed a gradation from low in normal mucosa to high in carcinoma, while acid phosphatase showed the reverse of that pattern. The tetrazolium reductase activity was low or moderate in normal and transitional mucosa and high in carcinoma. Based on these findings, a combination of enzyme techniques and techniques for mucosubstances are suggested for detecting malignant transformation in benign lesions, or in detecting precancerous change in histologically normal mucosa in a vulnerable population.

3212 OPPORTUNISTIC INFECTIONS IN COLON CARCINOMA. *(E.)* Keusch, G. T. (Mt. Sinai Sch. Med., City Univ. New York, N.Y.). *Am. J. Clin. Nutr.* 27(12):1481-1485, 1974.

The problem of infections occurring in the patient with colonic carcinoma are reviewed. For many reasons the patient with large bowel cancer becomes a compromised host. The classical symptoms of the disease result from invasive, fungating tumors or annular constricting lesions which often result in ulcerations of the intestinal mucosa, thus providing a direct route of access for invasion by intestinal microflora. The tendency for colonic neoplasms to remain undiagnosed for long periods of time also allows considerable growth and frequent metastases to lymph nodes and liver may result in severe anorexia and cachexia. Chemotherapy may add to the appetite depression of the tumor itself and decrease the adequacy of nutritional intake of the host. Protein malnutrition, from which profound immunological abnormalities result, may be observed. Severe toxicity may result from the concomitant use of 5-fluorouracil and high voltage radiotherapy. For these and other reasons the colonic cancer patient is compromised toward opportunistic infections. Nevertheless, these patients are not unduly susceptible to protozoan and fungal agents. They may become infected with members of the normal bacterial flora of the gut which are provided with a site for penetration of the colonic mucosal barrier by the invasive or necrotizing tumor. *Bacterioides sepsis*, *Clostridium septicum* and other clostridial infections (in the absence of deep traumatic lesions), and left perinephric abscess caused by coliforms and fecal streptococci appear to be characteristic associations with colonic neoplasia. It is stressed that subcutaneous abscess of the left perinephric abscess due to bowel flora must always be investigated to determine the portal of entry. Colonic carcinoma will be present in a significant number of cases. In the absence of a known colonic lesion, diagnostic workup should be performed in all such patients. In fact, a presumptive diagnosis of a splenic flexure lesion can be made in patients with a left perinephric abscess due to coliform bacilli. Barium enema is indicated in older patients with bacterial endocarditis in whom the portal of entry of the organism was not known.

3213 DIET AS AN ETIOLOGICAL FACTOR IN THE DEVELOPMENT OF CANCERS OF THE COLON AND RECTUM. *(E.)* Howell, M. A. (Natl. Cancer Inst., Bethesda, Md.). *J. Chronic Dis.* 28(2):67-80, 1975.

Food consumption studies, both national and international, were compared to a Japanese case control study to investigate relationships between meat consumption and bowel cancer. The Japanese study used bowel cancer patients and hospital controls matched on age, race, and sex. Total meat use differentiated cases from controls. Beef had the highest relative risk, while chicken and some sources of pork had insignificant relative risk. For the international food consumption data from 37 countries, food figures for beef and veal, total meat, and all food were correlated with mortality and incidence rates. In the U.S. food consumption data, 900,000 people filled out questionnaires on how many times per week they ate 16 different food types. Findings from the international data showed vegetable food sources to be independent or negatively related to intestinal or colonic cancer. All food sources other than vegetables showed high positive relationships. Highest correlations were from per capita consumption of total meat and fat from all food sources. Factor analysis showed that foods associated with the highest mortality rates for colon, breast, and prostate were sugars, meats, eggs, milk and fats. In the U.S. study, no diet items were found to be associated with bowel cancer. In a 1948 study by the Dep. of Agriculture, however, food consumption differences were found for geographical areas and races, which contrasted in bowel cancer mortality or incidence rates. The 1947 incidence rates were 24.6/100,000 in San Francisco, and 17.6/100,000 in Birmingham, while these 2 cities were highest and lowest resp. in consumption of beef, veal and lamb. Results suggest that meat, particularly beef, is associated with malignancy of the large bowel.

3214 CARCINOEMBRYONIC ANTIGEN AND PROGNOSIS IN PATIENTS WITH COLON CANCER. *(E.)* Gerfo, P. L.; Herter, F. P. (Coll. Physicians Surg., Columbia Univ., New York, N.Y.). *Ann. Surg.* 181(1): 81-84, 1975.

Carcinoembryonic antigen serum levels were compared before and after surgery for carcinoma of the colon. One hundred fifty patients with non-metastatic carcinoma were followed for 24-36 months after colonic resection. Antigen levels greater than 4.0 ng were considered to be elevated. Patients were divided according to Duke's classification of tumor invasiveness into stages A, B and C in increasing severity. High preoperative antigen levels were found in 4 of 25 stage A patients, 25 of 61 stage B, and 39 of 64 stage C. Of the patients who died or survived uncured, 57% had high levels, while only 32% of those successfully cured had high levels. Three of 5 in stage A who died or were uncured had high levels, while 53% of those in stage B, and 70% of those in stage C, who died or were uncured had high levels. In contrast, of those who were cured, only 1 in stage A, 36% in stage B, and 40% in stage C had high levels. It is concluded that high carcinoembryonic antigen levels are correlated with the extent of the disease, and high preoperative levels are associated with poor prognosis.

3215 SPIRAL-SHAPED ORGANISMS ON THE SURFACE COLONIC EPITHELIUM OF THE MONKEY AND MAN.

(E.) Takeuchi, A.; Jervis, H. R.; Nakazawa, H.; Robinson, D. M. (Walter Reed Army Inst. Res., Washington, D.C.). *Am. J. Clin. Nutr.* 27(11):1287-1296, 1974.

Intestinal spirochetosis was studied in 221 healthy Rhesus monkeys and in specimens from 598 patients by histology, histochemistry, transmission and scanning electron microscopy. Of the 221 monkeys, 31 (14.0%) were massively infected by spiral organisms in the colon, 19 (8.5%) were infected in both colon and rectum and 12 (5.5%) were diffusely infected from cecum to rectum throughout, for an overall incidence of 28%. There were 210 colonic specimens from human subjects, of which 4 were affected by intestinal spirochetosis, 2 of which were associated with adenomatous polyp and the remaining 2 represented normal colonic mucosa. Of the 388 appendices from human subjects, 8 cases (2.1%) showed intestinal spirochetosis. Only 1 specimen showed mild acute appendicitis; the remaining 7 were normal. There were no significant gastrointestinal symptoms with the exception of 2 cases, 1 had a related history of epigastric discomfort and dyspepsia and the second had fever and right lower quadrant pain, symptoms which appear attributable to cholelithiasis and acute appendicitis, resp. The morphologic and ultrastructural findings of this study indicate that the characteristics of intestinal spirochetosis in the rhesus monkey and man are essentially identical in both species. Spiral organisms stained with hemotoxylin and eosin appear as broad basophilic haze on the colonic surface and are strongly positive by Warthin-Starry (silver) stain. Spiral-shaped organisms included 2 structurally different organisms, spirochetes and flagellated microbes. They intimately populated the brush border region of the surface of the colonic epithelium. They were absent in the crypt and small intestine. Infestation produced no alterations of cytocomponents of the underlying host structures. From the observations of this study it is evident that under certain conditions of local microenvironment, spiral microbes may invade the gut mucosa. It is suggested that, when such mucosal penetration occurs in large numbers, it can cause structural alteration and clinical symptoms in the host.

3216 ERRORS IN THE DIAGNOSIS OF CANCER OF THE COLON IN YOUNG PEOPLE.

(Rus.) Parakhoniak, V. I. (Gorki Med Inst., USSR). *Khirurgiia (Mosk.)* (1):107-111, 1974.

Retrospective studies of 340 patients treated between 1950 and 1971 for cancer of the colon showed that 64 (33 males, and 31 females) were 20-40 yr of age (one patient was 5 yr old). The study revealed a high incidence of diagnostic errors. Only 19 of the 64 patients (30%) were diagnosed properly. Radical surgery could be performed only on 39 patients (61%). Histological examination showed that 33 patients had adenocarcinomas; four mucous cancer; and two solid cancer. The 5-yr survival was recorded in 17 patients, which accounted for 48.6% of radical operations. A case is reported of a 34-yr-old man treated for over 1 yr for chronic hyperplastic gastritis and intercostal neuralgia. The patient was hospitalized with acute abdonimal pain and high fever. The case was successively diagnosed as dysentery, pancreatitis, perigastritis, hyperplastic gastritis and staphylococcosis of the bile ducts. Endoscopic examination finally revealed an intestinal stenosis at the splenic flexure. The surgery found a 15 cm x 15 cm tumor which penetrated into the diaphragm, thoracic wall, retroperitoneal space, the greater curvature of the stomach and the pancreas. Metastases were observed. The patient was pronounced inoperable. It is suggested that a clinical feature of cancer of the colon in young people is vague symptoms in the early stage of the disease.

3217 THE EFFECT OF WHEAT BRAN ON INTESTINAL TRANSIT.

(E.) Payler, D. K.; Pomare, E. W.; Heaton, K. W.; Harvey, R. F. (Malvern Coll., Worcs, England). *Gut* 16(3):209-213, 1975.

A controlled study was carried out on the effect of bran upon intestinal transit to exclude possible psychological effects. Transit time was determined in 20 healthy volunteers before and after the addition of bran to their diet; transit time was taken as the time required to pass 20 of 25 radiopaque pellets. After the addition of approximately 20 g bran/day to the diet, transit time fell from 2.75 to 2.0 days. Transit became faster in nine subjects who had an initial time 3 days or more, and in 3 of 7 with an initial time of 2 days, but became slower in four with an initial transit of 1 day. Frequency of defecation was not related to transit time and did not increase significantly with bran. In 10 additional volunteers with initial transit of 3-4 days, the effect of bran was compared with than of an equal volume of ground oatflakes. Bran caused a significant acceleration of transit, whereas oatmeal had no effect. The results confirm that wheat bran accelerates intestinal transit when transit is initially 3 days or longer, and the effect is likely due to the high content of cellulose and hemicelluloses in the bran; it may also slow down fast transit.

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3285 ETIOLOGY OF HEMORRHOIDS. *(Fr.)* Bensaude, A. (Valere-Lefebvre Hosp., Le Raincy, France). *Ann. Gastroenterol. Hepatol. (Paris)* 10(2): 95-105, 1974.

3286 CHANGES IN SERUM COMPLEMENT ACTIVITY IN APPENDICITIS. *(Rus.)* Finn, G. R.; Kuznetsov, V. I. (Volgograd Med. Inst., USSR). *Vestn. Khir.* 113(9):28-30, 1974.

3287 TOXIC HEPATOCELLULAR AND RENAL DAMAGE DURING ACUTE APPENDICITIS. *(Pol.)* Sycinski, Z. (L. Rydygier Munic. Hosp., Wroclaw, Poland). *Wiad. Lek.* 27(11):1021-1023, 1974.

3288 ADHESIONS AS A SEQUELA OF APPENDECTOMY. *(Rus.)* Karyakin, A. M.; Ivanusa, Y. M. (S. M. Kirov Mil. Med. Acad., Leningrad, USSR). *Khirurgiia (Mosk.)* (2):68-70, 1974.

3289 THE PROBLEM OF ACUTE APPENDICITIS. *(Rus.)* Zakharova, G. N.; Shekhov, V. P. (Saratov Med. Inst., USSR). *Khirurgiia (Mosk.)* (2):70-76, 1974.

See also, 2827, 2862, 2868, 2881, 2899, 2900, 2901, 2903, 2904, 2934, 2946, 2956, 3048, 3071, 3136, 3137, 3139, 3140, 3143, 3144, 3148, 3153, 3168, 3174, 3175, 3301, 3651, 3672, 3676, 3677, 3679, 3685, 3748, 3754, 3770, 3771, 3783.

LARGE INTESTINE

Ulcerative Colitis

3290 THE SIGNIFICANCE OF ELEVATION OF SERUM CARCINOEMBRYONIC ANTIGEN (CEA) LEVELS IN INFLAMMATORY DISEASES OF THE INTESTINE. *(E.)* Booth, S. N.; King, J. P. G.; Leonard, J. C.; Dykes, P. W. (Med. Sch., Univ. Birmingham, England). *Scand. J. Gastroenterol.* 9(7):651-656, 1974.

Serial CEA measurements were made over a 12-month period in 133 patients with ulcerative colitis, 139 patients with Crohn's disease, 10 with diverticular disease and 20 with adult celiac disease. Elevated CEA levels occurred in ulcerative proctocolitis (9%), Crohn's disease (22%), and in one patient with diverticular disease. In Crohn's disease there was a significant increase in the number with persistent elevations when the history was longer than 10 yr. No significant relation to either duration or extent of disease was noted in ulcerative colitis. Transient elevations were often associated with exacerbations of the disease process. In 2 patients with ulcerative proctocolitis and in one with Crohn's disease, persistently abnormal CEA levels were associated with markedly abnormal liver function tests and abnormal hepatic biopsies. However, in 4 others with ulcerative colitis and hepatic involvement, serum CEA concentrations were normal. A rising value of 25 ng/ml was noted in one patient with completely resected Crohn's disease, but in whom steatorrhea was noted later to be associated with bacterial contamination of the small bowel and extensive jejunal diverticulosis. It is postulated that bacterial action results in enzymatic degradation of normal gastrointestinal cellular degradation products to produce or uncover an antigenic determinant identical to that on the CEA molecule. Two patients with ulcerative colitis developed a complicating carcinoma and both had normal CEA levels. It is concluded that, although CEA measurements may be valuable in cancer follow-up and possibly in the undiagnosed patient, they do not currently look promising as an indicator of malignant complications in inflammatory bowel disease.

3291 STUDIES OF LACTIC DEHYDROGENASE CONTENT IN RECTAL MUCOSAL BIOPSIES. *(E.)* Hunt, P. S.; Dennis, P. M.; Jablonski, P.; Khoo, S. K.; McLeod, L.; Thomson, H. D. P.; Watts, J. M. (Prince Henry's Hosp., Melbourne, Australia). *Gut* 15(12): 972-976, 1974.

The total lactic dehydrogenase content and lactic dehydrogenase isoenzyme ratios were studied in homogenized rectal mucosa from 31 patients with established non-specific mucosal ulcerative colitis and from 16 normal subjects. The 31 patients included 16 males and 15 females, aged 21-72 yr, of whom 14 had active rectal disease and 17 had mild or inactive disease. Of the 14 with active disease, 8 had chronic ulcerative colitis and 6 had ileo-rectal anastomosis. The total lactic dehydrogenase content was significantly increased in patients with active ulcerative colitis when compared with patients with inactive ulcerative colitis or with normal subjects. There was a similar though not a significant increase in the slow moving isoenzymes of lactic dehydrogenase in samples of rectal mucosa from patients with active colitis. The lactic dehydrogenase isoenzyme pattern was in the normal range in 2 of the 3 patients with histological premalignant changes in rectal biopsy specimens. There was a statistically significant linear correlation between the total lactic dehydrogenase content of rectal mucosa and the carcinoembryonic antigen levels in whole serum. Both the total content and isoenzyme ratios of lactic dehydrogenase were increased in neoplastic tissue obtained from patients with carcinoma of the colon and with tissue from benign rectal polyps. It is suggested that the increased lactic dehydrogenase content may be an expression of an oxygen deficit in the mucosal cells of patients with acute ulcerative colitis, rather than an index of premalignancy.

3292 SEQUELAE OF COLECTOMY AND ILEOSTOMY: COMPARISON BETWEEN CROHN'S COLITIS AND ULCERATIVE COLITIS. *(E.)* Steinberg, D. M.; Allan, R. N.; Brooke, B. N.; Cooke, W. T.; Alexander-Williams, J. (Gen. Hosp., Birmingham, England). *Gastroenterology* 68(1):33-39, 1975.

A comparison was made between the immediate and long term mortality of colectomy and ileostomy performed in 73 patients with Crohn's colitis and 442 patients with ulcerative colitis. In Crohn's disease the immediate mortality is 4%. In ulcerative colitis it is 10%, chiefly because of the higher proportion of emergency operations in the latter disease. The late mortality in both groups is 10%, though for different reasons. Complications due to recurrent disease are a major factor in causing death of patients with Crohn's disease. Disseminated malignancy of the colon was the principal cause of late death after excisional surgery for ulcerative colitis. A further comparison was made between the postoperative course of the 64 surviving patients with Crohn's disease and a comparable sample of 65 patients who had an ileostomy for ulcerative colitis in the same time period. There was a similar incidence of postoperative septic complications in the two groups, 35%. The readmission rate was twice as high in the Crohn's disease patients. Ileostomy reconstruction for mechanical complication was required in 21 patients with Crohn's disease, compared with 6 with ulcerative colitis. Further ileal resection was necessary for recurrent disease on another 25 occasions in the patients with Crohn's disease, but never in those with ulcerative colitis. Long term review graded the clinical status as excellent or good in 70% of those with Crohn's disease compared with 95% with ulcerative colitis. These results do not condemn the operation of colectomy and ileostomy for Crohn's disease, but excisional surgery is not recommended with the same optimism as for patients with ulcerative colitis.

3293 AZATHIOPRINE IN ULCERATIVE COLITIS: FINAL REPORT ON CONTROLLED THERAPEUTIC TRIAL. *(E.)* Jewell, D. P.; Truelove, S. C. (Radcliffe Infirm., Oxford, England). *Br. Med. J.* 4(5945):627-630, 1974.

Eighty patients, all suffering from a frank clinical attack of ulcerative colitis, were part of a controlled therapeutic trial of azathioprine. The attack was treated with a standard course of corticosteroids. For outpatients, oral prednisolone was given 5 mg four times a day and prednisolone disodium retention enema nightly. The inpatients were given prednisolone 21-phosphate 40 mg/day in the i.v. fluid, tetracycline 1 g/day in divided doses in the i.v. fluid, and rectal drip of hydrocortisone hemisuccinate sodium 100 mg twice daily. If clinical response was good, feeding was resumed and oral prednisolone, 40 mg/day was given in divided doses. When discharged the patients were placed on the outpatient regimen. In addition to this standard corticosteroid course, the patients were immediately placed on treatment with either azathioprine in a dose of 2.5 mg/kg or dummy tablets. Trial tablets were continued for 1 yr. If a patient relapsed, a further course of corticosteroids was given without interrupting maintenance treatment with azathioprine. During azathioprine, side effects were few and not dangerous. No example of frank bone-marrow supression was noted. One patient developed nausea, abdominal discomfort, and diarrhea. One developed a generalized erythematous rash. Patients on azathioprine had a greatly reduced production of plasma cells and K cells. In the treatment of an actual attack of ulcerative colitis, results indicate that no benefit came from adding azathioprine to the standard corticosteroid therapy. Patients admitted in their first attack showed no benefit from the 1 yr maintenance with azathioprine, the benefits of which were confined to patients admitted in a relapse of established disease. Even in these, the difference between treated and control patients failed to reach statistical significance, but the difference was great enough to suggest there is a prima facie case for regarding azathioprine as of some benefit in this group of patients.

3294 ELECTRICAL POTENTIAL DIFFERENCE AND ABSORPTION OF WATER, SODIUM, AND POTASSIUM BY THE TERMINAL ILEUM OF ILEOSTOMY PATIENTS. *(E.)* de Moraes Filho, J. P.; Salas-Coll, C.; Blendis, L.; Edmonds, C. J. (Cent. Middlesex Hosp., London, England). *Gut* 15(12):977-981, 1974.

Measurements of electrical potential difference and of absorption by a dialysis method were carried out in the terminal ileum of 11 patients (7 males and 4 females, aged 24-54 yr) with an ileostomy. The studies were performed between 2 weeks and 6 yr after formation of the ileostomy. In 6 patients the potential difference measured 3 cm from the ileostomy stoma showed a mean of 14.3 mV, compared to a mean of 9.2 mV when measured at 10 cm from the stoma. The potential difference thus appeared to be significantly increased close to the stoma. In 5 patients the potential difference was measured repeatedly over a period of 8 months with very little variation observed. The time for which the ileostomy had been established also appeared to have little effect on the potential difference. The measured potential difference increased considerably when glucose was added to the luminal solution, even though osmolality was kept constant. The effect was reversed rapidly when the glucose-containing solution was removed. A concentration of 10 nM/liter of glucose had little effect, while a maximum effect was achieved with 40 nM/liter. In 11 subjects in the presence of glucose the potential difference had a mean value of 18.7 (SEM), while without glucose the value was 8.3 (SEM). Reducing the luminal sodium concentration from 130 to 13 nM/liter was consistently associated with a fall of potential difference from a mean of 9.4 to 2.1 mV, which reversed when sodium was reintroduced. With a saline bicarbonate solution (sodium 145 or 140 mEq/liter, K 5, or 10 mEq/liter) in the dialysis tube, considerable absorption of fluid and sodium was demonstrated with little change in sodium concentration. Potassium secretion occurred with the lower, and absorption with the higher, concentration. The final luminal potassium concentration reached was consistent with a passive distribution between blood and lumen. It was concluded that the ileal mucosa, beyond the first few centimeters of the stoma of an ileostomy, behaves similarly to the ileum of the intact gut in regard to potential difference, water, sodium, and potassium transport. The relatively simple methods available for study of the accessible part of the ileum after ileostomy, offer a useful means of examining the action of drugs and hormones and of testing the functional state of the ileum epithelium.

3295 IMPAIRMENT OF 'ILEOSTOMY ADAPTATION' IN PATIENTS AFTER ILEAL RESECTION. *(E.)* Hill, G. L.; Mair, W. S. J.; Goligher, J. C. (Gen. Infirm., Leeds, England). *Gut* 15(12):982-987, 1974.

Ileostomy adaptation was studied in 10 patients (4 women and 6 men, aged 26-63 yr) diagnosed with granulomatous disease (4) or ulcerative colitis (6). Ileostomy and proctocolectomy were performed on 8 patients, 3 of whom also underwent ileal resections. Ileostomy, right hemicolectomy, and ileal resections were performed on the remaining 2. For the group as a whole, there was no significant decrease in the ileostomy volume over the 6-month period, nor was any significant intestinal adaptation uncovered by i.v. saline loading. However, marked difference in the mean daily fecal output of resected patients was noted. For nonresected patients the mean daily fecal output during postoperative days 7-11 was 456 ml compared with 909 for resected patients. At 6 months the low daily fecal output of 430 ml for the nonresected group was significantly different from the high output of 1105 ml for resected patients. Although there was no response to i.v. saline loading in the resected group, there was a significant increase in the mean daily fecal volume in nonresected patients, from 430 to 553 ml. This indicates that the resected group not only had a higher mean daily fecal volume from the outset, but also that no meaningful adaptation of the intestine had occurred in the 6 months. Patients in whom the terminal ileum was preserved had not only a smaller volume ileostomy from the outset, but at 6 months intestinal adaptation was noted when the extracellular fluid volume was rapidly expanded by i.v. saline loading. Whereas there was a significant thickening of the ileostomy fluid after 6 months in patients with low volume ileostomies, no such decrease in water content was noted in those with a high volume ileostomy. There was no apparent conservation of sodium in either group over the 6 months, but after i.v. saline there was a significant increase in daily output and concentration of sodium in nonresected patients. The daily fecal output of potassium was not significantly different for any of the time periods or between either group. After 6 months, the sodium:potassium ratio in the urine was lower for resected patients, suggesting this group was conserving sodium more than the nonresected patients. The reverse is true for feces. Whereas urine conservation of sodium occurs at the renal tubule in the resected group at 6 months, this did not occur in the intestine. It appears that the response by the intestine to conserve sodium is no longer present in resected patients over the 6-month period, whereas this conservation process had persisted in the nonresected patients. There is no doubt that patients with an ileal resection can conserve fluid and sodium from the intestine, but the stimulus to do so apparently must be particularly strong.

3296 MUCOSAL-CELL COUNTS IN ULCERATIVE AND GRANULOMATOUS COLITIS. *(E.)* Sommers, S. C.; Korelitz, B. I. (Lenox Hill Hosp., New York, N.Y.). *Am. J. Clin. Pathol.* 63(3):359-365, 1975.

Epithelial and connective-tissue cells were counted in rectal mucosal biopsies from 215 patients with ulcerative colitis, 98 with granulomatous colitis and 50 controls. Significantly decreased mucous goblet cells were found both in sigmoidoscopically abnormal ulcerative colitis and in granulomatous colitis, and they increased during the healing process. More pyknotic and karyorrhectic epithelial cells occurred in active ulcerative colitis than in granulomatous colitis. Inactive ulcerative colitis still manifested histologic evidence of acute and chronic inflammation, while sigmoidoscopically normal granulomatous colitis biopsies after previous gross rectal disease showed significantly increased macrophages in the lamina propria. Cell counts were valuable for differential diagnosis after the sigmoidoscopic appearance became normal. To identify specific influences of medication, ulcerative colitis groups treated with salicylazosulfapyridine, prednisone, or 6-mercaptopurine were analyzed. Salicyazosulfapyridine therapy was associated with an overall decrease in mucosal leukocytes. Significantly decreased neutrophils were found after prednisone or 6-mercaptupurine, decreases in plasma cells occurred after all three types of therapy, and increased mast cells were found after 6-mercaptopurine. All three combinations of any two of these drugs were associated with significantly decreased plasma cells. Combinations of 6-mercaptopurine with either prednisone or salicylazosulfapyridine was correlated with increased macrophages. Prednisone with salicylazosulfapyridine was associated with significantly increased mast cells. The results of this study support the statement that colonic mucous goblet cells are reduced in active ulcerative colitis. Further, while the leukocytic exudates of these inflammatory intestinal diseases in active states differed only in the more abundant eosinophils in granulomatous colitis, in quiescent states ulcerative colitis and granulomatous colitis connective-tissue-cell populations were distinctive, with persisting exudative inflammation in ulcerative colitis and mobilized macrophages in granulomatous colitis.

3297 RED CELL ABNORMALITIES ASSOCIATED WITH SULPHASALAZINE MAINTENANCE THERAPY FOR ULCERATIVE COLITIS. *(E.)* Pounder, R. E.; Craven, E. R.; Henthorn, J. S.; Bannatyne, J. M. (Cent. Middlesex Hosp., London, England). *Gut* 16(3):181-185, 1975.

Red cell abnormality occurring in patients receiving sulphasalazine was studied to determine the incidence of such changes. Hematological studies were performed on blood samples taken from 50 patients receiving a mean dose of 2.5 g sulphasalazine/day as maintenance therapy for ulcerative colitis, 10 patients with ulcerative colitis not receiving sulphasalazine and 50 controls. Red cell morphology was assessed independently by two observers. Of the treated patients, 35 were found to have one or more drug-induced abnormalities not found in controls or in untreated patients. Contracted red cells were observed in 23 of the treated patients; the abnormality was related to the dose of sulphasalazine, the serum total sulphapyridine level, and acetylator status. Of the treated patients, 11 had a macrocytosis, 21 had elevated levels of methemoglobin, and one had Heinz bodies. A dose of 1.5 g sulphasalazine/day was not associated with red cell contraction, and is suggested as a safer dose for the long-term treatment of the asymptomatic colitis.

3298 THE THYROID IN ULCERATIVE COLITIS AND CROHN'S DISEASE. II. THYROID ENLARGEMENT AND HYPERTHYROIDISM IN ULCERATIVE COLITIS. *(E.)* Jarnerot, G.; Azad Khan, A. K.; Truelove, S. C. (Radcliffe Infirm., Oxford, England). *Acta Med. Scand.* 197(1/2):83-87, 1975.

The incidence of thyroid disease was surveyed in 300 patients with ulcerative colitis and 600 matched controls. The subjects were assessed for simple goiter type thyroid enlargement. A significant increase in frequency of simple goiter was observed in the ulcerative colitis patients (8.7%) compared with 4.3% in the controls. A history of thyrotoxicosis was obtained in 3.7% of the ulcerative colitis patients compared with 0.8% of the controls. In more than half the ulcerative colitis patients with a history of hyperthyroidism, the hyperthyroidism occurred years before the onset of the colitis, suggesting that hyperthyroidism is not likely to be a complication of colitis. Possible explanations for the association of the two diseases are discussed, but it is concluded that no satisfactory explanation has yet been offered.

3299 ULCERATIVE COLITIS. FOLLOW-UP OF 160 PATIENTS OBSERVED FOR AN AVERAGE OF 10 1/2 YEARS. *(Ger.)* Fahrlander, H.; Shalev, E. (Med. Dep., Univ. Basel, Switzerland). *Dtsch. Med. Wochenschr.* 99(43):2141-2147, 1974.

3300 BLEEDING RECTAL POLYPS AS A REASON FOR FALSE POSITIVE DIAGNOSIS OF NONSPECIFIC ULCERATIVE COLITIS IN CHILDREN. *(Rus.)* Kanshina, O. A.; Kanshin, N. N. (A. V. Rusakov Munic. Clin. Hosp. Child., Moscow, USSR). *Sov. Med.* (12):98-102, 1973.

3301 SURGICAL TREATMENT OF NONSPECIFIC INFLAMMATION OF THE LARGE INTESTINE. *(Pol.)* Goral, R.; Sniezynski, C.; Rychlewski, W.; Kociecka, W. (Acad. Med., Poznan, Poland). *Przegl. Lek.* 31(3):405-408, 1974.

3302 SURGICAL TREATMENT IN ULCERATIVE COLITIS. *(E.)* Rumpf, P. Kremer, K.; Jacobs, G.; Ulrich, B.; Hoffmann, E. (Surg. Clin., Univ. Dusseldorf, Germany). *Bruns Beitr. Klin. Chir.* 221(6):451-452, 1974.

See also, 2902, 3256, 3373, 3658, 3774.

3303 MALABSORPTION OF VITAMIN B_{12} WITH EXOCRINE PANCREATIC INSUFFICIENCY. *(Ger.)* Aenishanslin, H. W.; Stalder, G. A. (Med. Polyclin., Univ. Basel, Switzerland). *Schweiz. Med. Wochenschr.* 104(39):1377-1379, 1974.

Exocrine pancreatic function and vitamin B_{12} absorption, with and without intrinsic factor, were studied in 10 patients, aged 25-64 yr, with histories of chronic pancreatitis dating back 3-120 months. Three patients had malabsorption of vitamin B_{12}, both in the presence and absence of intrinsic factor, while 3 others had malabsorption of the vitamin B_{12}-intrinsic factor complex. Trypsin activities in intestinal juice were significantly decreased in patients with malabsorption of vitamin B_{12} in the presence and absence of intrinsic factor. These findings suggest that vitamin B_{12} malabsorption might have been caused by trypsin deficiency in these patients. In the 3 patients with malabsorption of the vitamin B_{12}-intrinsic factor complex, the findings could be explained if trypsin (1) facilitated binding between intestinal receptors in the ileum and the vitamin B_{12}-intrinsic factor complex and (2) split a hypothetical "binder" which blocks the vitamin B_{12}-intrinsic factor complex. None of the patients with reduced vitamin B_{12} absorption had macrocytic anemia. This is attributed to substitution therapy with trypsin.

3304 EXOCRINE PANCREATIC INSUFFICIENCY IN THE ABSENCE OF CYSTIC FIBROSIS IN INFANTS AND CHILDREN. *(Ger.)* Niessen, K. H.; Osswald, P.; Schmidt, K.; Hartmann, F.; Droste, E.; Brugmann, G. (Pediatr. Clin., Univ. Tubingen, Germany). *Monatschr. Kinderheilk.* 122(7):560-561, 1974.

Pancreatic function was tested in 54 patients, aged 2 months to 16 yr by the secretin-pancreozymin method. Six patients showed reduced enzyme activity, although cystic fibrosis was ruled out by several sweat tests. The cause of pancreatic insufficiency apparently differed in these 6 patients: 3 infants at age 2 months had mucosal atrophy. In one, this probably resulted from celiac disease with secondary pancreatic insufficiency, in another, probably from chronic fibrotic pancreatitis. The third child developed symptoms of pancreatic insufficiency as a result of acute pancreatitis caused by parasite infestation. One child suffered from intermittent neutropenia and increased vulnerability toward infection as in the Shwachman-Diamond syndrome. There was also a case of dwarfism, but no neutropenia or skeletal changes could be detected. Total bile acids in the intestinal juice were reduced in 2 and in the lower normal range in 1 of the patients with pancreatic insufficiency. Bile acid secretion was primarily decreased in the secretin phase. During the secretin-pancreozymin test, patients with total atrophy of the villi secreted significantly larger quantities of bile acids into the intestinal juice than 28 children with normal mucosa or partial atrophy of the villi.

3305 VASOACTIVE INTESTINAL POLYPEPTIDE IN VERNER-MORRISON SYNDROME. *(Ger.)* Seif, F. J.; Sadowski, P.; Heni, F.; Fischer, R.; Bloom, S. R.; Polak, J. M. (Med. Polyclin., Univ. Tubingen, Germany). *Dtsch. Med. Wochenschr.* 100(9):399-405, 1975.

A 40-yr-old man who had been treated for a stomach ulcer 4 yr previously and who had a family history of cancer was hospitalized with intractable diarrhea, hypokalemia, pentagastrin-refractory hypochlorhydria, and reduced pancreatic secretion of bicarbonate, trypsin, chymotrypsin, amylase, and lipase. Radioimmunological studies showed a plasma concentration of vasoactive intestinal polypeptide (VIP) of 800 pg/ml (normal < 100 pg/ml). Plasma concentrations of gastrin-inhibiting polypeptide (GIP), pancreatic glucagon, secretin, and gastrin were all within normal limits. At laparoscopy, multiple metastases were found in the right lobe of the liver, but the type of primary tumor could not be established histologically. Diarrhea did not respond to cytostatic therapy with 5-fluorouracil and cyclophosphamide; symptomatic therapy with tincture of opium, charcoal, pancreatic enzymes, and acid substitution; 0.625 mg pentagastrin s. c. every 3 hr for 3 days; serotonin antagonists and inhibitors of serotonin synthesis (8 mg cyproheptadine 4 times a day, 4 mg methysergid twice a day, 1000 mg DL-*p*-chlorophenylalanine 4 times a day); or prostaglandin synthetase inhibitors (500 mg acetylsalicylic acid 3 times a day, 100 mg indomethacin 3 times a day). Improvement in the diarrhea occurred only with daily infusions of 500 ml of concentrated amino acid solution. Diarrhea ceased and parenteral correction of the water and electrolyte balance became unnecessary 36 hr after administration of 100 mg prednisolone 21-succinate sodium i. v. followed by 10 mg fluocortolone p. o. every 6 hr, but subclinical diabetes mellitus became manifest and was treated with 12 IU depot insulin twice a day. At surgery, a primary non-β-cell islet carcinoma which was strongly positive for VIP was removed from the head of the pancreas; the right lobe of the liver was partially resected; and a cholecystectomy was performed. Lymph node metastases were found at the root of the mesentery and the porta hepatis. Diarrhea did not recur when prednisolone 21-succinate sodium and ACTH were discontinued 1 week after surgery, and plasma VIP concentrations decreased to normal levels. However, the patient developed abdominal abscesses and died of septic cardiovascular failure 68 days after surgery.

3306 POSSIBLE PARATHYROID ORIGIN OF GASTRIN IN A PATIENT WITH MULTIPLE ENDOCRINE ADENOPATHY TYPE I. *(E.)* Cassar, J.; Polak, J. M.; Cooke, W. M. (Hammersmith Hosp., London, England). *Br. J. Surg.* 62(4):313-316, 1975.

A 52-yr-old woman with multiple endocrine adenopathy type I (pituitary, parathyroids, and islet cells) presented with spontaneous hypoglycemia that resolved after removal of two large pancreatic insulinomas, 1 in the tail and the other in the body of the pancreas. Shortly after her discharge the patient was readmitted with severe epitastric pain, hematemesis, and melena. Despite a rise in serum gastrin, there was no evidence of a gastrin-producing tumor. The serum gastrin remained high after truncal vagotomy and pylorplasty were carried out for a bleeding duodenal ulcer and after an antrectomy was performed due to persistent melena. After antrectomy, the basal acid output was 3.1 mEq/hr; peak acid output in response to pentagastrin, 11.3 mEq/hr; and fasting gastrin, 538 pg/ml. The serum gastrin level remained high until hypercalcemia and hyperparathyroidism had been corrected by subtotal parathyroidectomy. In the resected portions of the parathyroid glands, there was diffuse hyperplasia affecting both chief and oxyphil cells. The latter were identified by the presence of numerous mitochondria (mitochondrion-rich cells) and contained electron-dense polymorphic secretory granules predominantly localized toward the vascular poles of the cells. Antiserum against human parathyroid hormone showed reactive chief cells scattered throughout the glands and concentrated around blood vessels. Most of the oxyphil cells were stained positively with an antiserum against human gastrin I. This finding suggests that these cells were the source of the gastrin.

3307 PANCREATIC ABSCESS: A CRITICAL ANALYSIS OF 113 CASES. *(E.)* Camer, S. J.; Tan, E. G. C.; Warren, K. W.; Braasch, J. W. (Lahey Clin. Found., Boston, Mass.). *Am. J. Surg.* 129(4):426-431, 1975.

Records of 113 patients (48 women and 65 men, aged 35-76 yr) with pancreatic abscess were reviewed in an effort to define diagnostic, therapeutic, and prognostic parameters of importance in the management of this disorder. The cases, seen over a 23-yr period, were analyzed in terms of signs, symptoms, and laboratory data, bacteriologic, radiologic, and operative findings, and management. Of the 107 patients who underwent operative drainage, 17.7% died. Complications were varied and often multiple, only 24 patients having and entirely smooth course. Complications included hemorrhage, pulmonary problems, renal and hepatic failure, postoperative fistula, postoperative gastric retention, prolonged ileus, and residual abscess requiring operative drainage. Among 88 survivors, there were 12 known deaths within the first 6 months. Deaths were due to pancreatic carcinoma, duodenal carcinoma, chronic inanition and spesis, adrenal insufficiency, liver failure, and myocardial infarction. Forty-nine patients are alive, 30 of whom have been asymptomatic or have had mild symptoms of no functional significance. Seventeen patients required further operations on the pancreas and biliary system and 19 patients have pain and symptoms of pancreatic insufficiency. Useful diagnostic aids include radiographic examination, selective visceral angiography, and ultrasonic scanning. Successful management involves a timely, aggressive surgical approach, with wide debridement and sump drainage and liberal use of supportive measures such as feeding jejunostomy, gastrostomy, colloid infusion, and enteral and parenteral hyperalimentation.

3308 MORPHOLOGICAL CHANGES IN THE PANCREAS IN SYSTEMIC LUPUS ERYTHEMATOSUS AND SYSTEMIC SCLERODERMA. *(Rus.)* Skorodumova, N. P. (Donetsk Med. Inst., USSR). *Vrach. Delo* (2):32-36, 1975.

Histological studies were performed on sections from the head, body, and tail of the pancreas, major pancreatic artery, and large pancreatic veins from 204 autopsies of collagen patients, of whom 50 had systemic lupus erythematosus (SLE) and 25 had systemic scleroderma (SS). The pancreas was affected in 20 cases of SLE and in nine cases of SS. Changes were observed in all the structural components of the pancreas (vessels, stroma and parenchyma). The most significant changes were found in the intrapancreatic ramifications of the pancreatic artery in the form of mucoid swelling, fibrinoid changes, cellular reactions and sclerosis. Changes in the veins consisted of either a moderate or marked sclerosis of the walls, edema and small lymphoid infiltrates in the outermost layer. Sclerosis of the walls of the veins prevailed in SS, while edema and cellular infiltration were more characteristic of SLE. The foci of mucoid and fibrinoid swelling were characteristic dystrophic changes of the pancreatic stroma in SLE, while pronounced sclerotic processes in the stroma, the walls of the ducts and perivascular tissue were more characteristic of SS. Atrophic and dystrophic changes were observed in the pancreatic parenchyma. A correlation was observed between the changes in the parenchyma and the vessels. This suggests a possible secondary involvement of the parenchyma in the pathological process.

3309 PANCREATIC EXTRACTS IN THE TREATMENT OF PANCREATIC EXOCRINE INSUFFICIENCY. *(E.)* Saunders, J. H. B.; Wormsley, K. G. (Dep. Therap., Univ. Dundee, Scotland). *Gut* 16(2):159-162, 1975.

3310 FOLLOWUPS OF PANCREATIC INSUFFICIENCY TREATED WITH PANPUR SUBSTITUTION THERAPY: USE OF THE FECAL LIPID PATTERN. *(Ger.)* Erb, W.; Siede, W. (Cent. Intern. Med., Johann Wolfgang Goethe Univ., Frankfurt/Main, Germany). *Z. Gastroenterol.* 13(1):35-43, 1975.

3311 ANTIBIOTICS AND FAECAL TRYPTIC ACTIVITY. *(E.)* Morrison, P. S.; Barnes, G. L. (St. Bartholemew's Hosp., London, England). *NZ Med. J.* 80(530):544-546, 1974.

3312 ANNULAR PANCREAS IN THE ADULT. *(E.)* Olin, R.; Norum, H. A. (Dep. Intern. Med., Fargo Clin., N.D.). *Minn. Med.* 58(3):248-250, 1975.

3313 NECROTIC PANCREATIC PSEUDOCYST ACCOMPANIED BY DYSPHAGIA AND STENOSIS OF THE CELIAC TRUNK. *(Fr.)* Latreille, R.; Bodin, J. P.; Le Toublon, C. (Grenoble Reg. Hosp. Cent., La Tronche, France). *Lyon Chir.* 70(4):256-258, 1974.

3314 SURGERY FOR EXTERNAL PANCREATIC FISTULAS. *(Rus.)* Danilov, M. V. (A. V. Vishnevskii Inst. Surg., Moscow, USSR). *Khirurgiia (Mosk.)* (3): 112-113, 1974.

3315 PANCREAS REJECTION IN COMBINED PANCREATICODUODENAL AND RENAL ALLOTRANSPLANTATION IN MAN. *(E.)* Largiader, F.; Uhlschmid, G.; Binswanger, U.; Zaruba, K. (Canton. Hosp., Zurich, Switzerland). *Transplantation* 19(2):185-187, 1975.

3316 FUNCTIONAL DISTURBANCES OF THE PANCREAS CAUSED BY TOXIC CHEMICALS. *(Rus.)* Kleiner, A. I.; Vasilenko, N. M.; Sonkin, I. S.; Ostrovskaia, I. S.; Iashina, L. N.; Liss, N. L. (Inst. Ind. Hyg. Occupational Dis., Kharkov, USSR). *Gig. Tr. Prof. Zabol.* (10):15-18, 1974.

3317 CARCINOMA OF THE PANCREAS. RESULTS FROM THE VERMONT TUMOR REGISTRY. *(E.)* Leadbetter, A.; Foster, Jr., R. S.; Haines, C. R. (Univ. Vermont Coll. Med., Burlington). *Am. J. Surg.* 129(4):356-360, 1975.

3318 SURGICAL TREATMENT OF PANCREATIC CYSTS. *(Rus.)* Dobychina, L. I.; Trunin, M. A. (Leningrad Sanit. Hyg. Med. Inst., USSR). *Vest. Khir.* (3):29-32, 1975.

3319 IMPAIRED DIGESTION: ITS CAUSES, DIAGNOSIS, AND TREATMENT. *(Ger.)* Worning, H. (Glostrup Hosp., Denmark). *Z. Gastroenterol.* 13(Suppl.): 158-165, 1975.

See also, 2405, 2573, 2861, 2867, 2872, 2878, 2883, 2905, 2906, 2907, 2908, 2912, 2918, 2945, 2949, 2961, 2963, 2966, 2967, 3012, 3080, 3112, 3188, 3327, 2618, 3704.

PANCREAS

Pancreatitis

3320 CHRONIC PANCREATITIS, SCLEROSING CHOLANGITIS, AND SICCA COMPLEX IN TWO SIBLINGS. *(E.)* Waldram, R.; Tsantoulas, D.; Kopelman, H.; Williams, R. (King's Coll. Hosp., London, England). *Lancet* 1(7906):550-552, 1975.

A new syndrome of chronic pancreatitis, sclerosing cholangitis, sicca complex, and other features was found in a brother and sister, aged 36 and 31 yr, resp. The woman's history of difficulties extended over a 5 yr period; the brother had had intermittent epigastric pains from the age of 10. In both, the main features were now those of chronic pancreatitis and sclerosing cholangitis. Additionally, the brother had sialectasis, generalized lymphadenopathy, and moderate leukopenia, while the sister showed the histological and clinical features of sicca complex and eosinophilia. Obstruction of the lower end of the common bile duct, a very rare complication of chronic pancreatitis, was present in both patients. Leucocyte migration was measured in these 2 cases as part of a larger study of cellular immunity in patients with chronic liver disease. In 4 of 5 cases of sclerosing cholangitis, including both of these presently reported cases, migration was significantly inhibited. Leukocytes from their parents and from one of the 2 apparently healthy siblings migrated normally in the presence of the bile antigen. Migration inhibition has not been found in patients with extrahepatic obstruction due to gallstones or pancreatic carcinoma. The bile antigen has been shown to be derived from the bile duct epithelial cells, and the finding of cellular immunity to this material in sclerosing cholangitis suggests that immune mechanisms may be important in the pathogenesis of this disease.

3321 THE AETIOLOGY OF HYPOCALCAEMIA IN ACUTE PANCREATITIS. *(E.)* Condon, J. R.; Ives, D.; Knight, M. J.; Day, J. (St. Mary's Hosp., Eastbourne, England). *Br. J. Surg.* 62(2):115-118, 1975.

The mechanism of hypocalcemia in acute pancreatitis was investigated in 30 patients. Parathyroid hormone was assayed in 11 of 12 hypocalcemic patients and three of 18 normocalcemic patients. Calcitonin was assayed in three of the hypocalcemic patients. Glucagon was assayed in all of the above and in 12 additional normocalcemic patients, 11 of whom had measurements made before and after administration of glucagon (1 mg i.v. followed by 1-1.5 mg 4-hourly i.v. infusion). All measurements were made by radioimmunoassay. Parathyroid hormone was undetectable in the plasma of eight hypocalcemic patients (calcium 7.8 mg/100 ml). One hypocalcemic patient had an elevated parathyroid hormone level of 675 pg/ml. One hypocalcemic and two normocalcemic (9.0-9.9 mg/100 ml) patients had parathyroid hormone levels of 100-175 pg/ml. Three subjects showed serial changes in parathyroid hormone level. One showed a drop from 1.5 ng/ml to 0.5 ng/ml along with a calcium level drop of 8.9 to 8.5 mg/100 ml within 24 hr. A second was normocalcemic with a high parathyroid hormone level that fell gradually. The third was hypocalcemic initially, but both the parathyroid hormone level and calcium level rose; glucagon administration did not result in hypocalcemia in these last two. Calcitonin was not detected in three of the hypocalcemic patients. Mean fasting glucagon levels were 0.48 in 15 normal subjects, and 0.45 in 26 pancreatitis patients. After glucagon infusion, plasma glucagon rose significantly by 3.4-4.0 ng/ml in 1 hr except in two patients. Plasma calcium fell significantly from 0-12 hr, while there was no significant difference in glucagon levels from 1-12 hr. Between 0 and 1 hr, the greater the increase in glucagon concentration, the smaller the fall in plasma calcium. There was no such relationship at 12 hr. It is concluded that persistent hypocalcemia associated with acute pancreatitis is due to a relative deficiency of parathyroid hormone level and is unrelated to glucagon and calcitonin levels.

3322 LIPODYSTROPHY, PANCREATITIS, AND EOSINOPHILIA.

(E.) Smith, P. M.; Morgans, M. E.; Clark, C. G.; Lennard-Jones, J. E.; Gunnlaugsson, O.; Jonasson, T. A. (Univ. Coll. Hosp., London, England). *Gut* 16(3):230-234, 1975.

Two cases are presented of partial lipodystrophy associated with pancreatitis and eosinophilia. In each case the onset of the lipodystrophy was at the age of 5 yr. In one case, recurrent eosinophilia was associated with episodes of recurrent acute pancreatitis. There was also an attack of left renal pain, followed by a temporary impairment of renal function at one point. In the second case there was chronic pancreatitis associated with eosinophilic gastroenteritis. Bilateral non-obstructive hydronephrosis was also diagnosed. Partial lipodystrophy is commonly associated with renal disease, but has never before been associated with pancreatitis. It is suggested that in these cases the eosinophilia was associated with the pancreatitis, but no conclusions are drawn between the interrelationship of the pancreatitis, eosinophilia, and lipodystrophy.

3323 INTENSIVE CARE IN ACUTE PANCREATITIS.

(Ger.) Schonborn, H. (2nd Med. Clin., Univ. Mainz, Germany). *Langenbecks Arch. Chir.* 245-250, 1974.

Of 20 patients who died of acute pancreatitis despite intensive care, all had hemorrhagic necrotizing pancreatitis. Acute renal failure, acute encephalopathy (both of which are irreversible), and shock are indicative of fatal pancreatitis. In patients who survived for less than 12 days, these symptoms manifested themselves within the first 3 days of illness. A pancreatectomy (Child) was performed on 10 patients with total necrosis of the pancreas. Four patients died. Of the 6 that survived, all had normal renal function at the time of operation. It is concluded that severe cases of pancreatitis which might prove fatal should be operated on as soon as possible, and no later than the 6th to 8th day of illness.

3324 ANTINUCLEAR FACTORS IN PATIENTS WITH PANCREATITIS OF UNKNOWN ETIOLOGY. ARE THERE CLEAR INDICATIONS OF AN IMMUNOLOGICAL GENESIS? *(Ger.)*

Neher, M.; Lemmel, E. M. (Surg. Clin., Univ. Mainz, Germany). *Dtsch. Med. Wochenschr.* 100(8):362-367, 1975.

Indirect immunofluorescence was used to determine antinuclear antibodies in sera from 31 patients with pancreatitis. The cause of the pancreatitis (trauma, biliary disease, alcohol abuse) was known in 20 cases and unknown in 11. None of these patients had any other diseases, such as systemic lupus erytheomatosus or liver disease, which are known to be accompanied by the production of antinuclear antibodies. Antinuclear antibodies were present, in most cases in high titers, in 8 of 22 patients with chronic pancreatitis and in 4 of 9 patients with acute pancreatitis. These antinuclear antibodies were shown to consist of IgG and IgM. Of the 11 patients with pancreatitis of unknown etiology, 9 had positive tests for antinuclear antibodies, while only 3 of the 20 with pancreatitis of known etiology had positive tests. With 1 exception, antinuclear antibodies were present in the first sample of serum taken from patients with acute pancreatitis. These findings suggest that some forms of pancreatitis might be autoimmune in nature.

3325 SECRETIN-PANCREOZYMIN TEST. *(Ger.)*

Tympner, F.; Domschke, W.; Koch, H.; Demling, L. (Med. Clin., Univ. Erlangen-Nuremberg, Erlangen, Germany). *Dtsch. Med. Wochenschr.* 99(32):1611-1615, 1974.

After placing a Lagerlof tube in the stomach and duodenum, the secretin-pancreozymin test was performed on 50 normal subjects (29 men and 21 women; mean age 33.2 yr); 34 patients (23 men and 11 women; mean age 38.7 yr) 3-8 weeks after the onset of acute pancreatitis; 48 patients (38 men and 10 women; mean age 41.5 yr) with chronic pancreatitis; 86 patients (51 men and 35 women; mean age 47.3 yr) suspected of having pancreatic disease; and 15 patients (11 male and 4 female; mean age 23.6 yr) with juvenile diabetes. During the entire 2.5 hr, a ^{58}Co-labeled vitamin B_{12} solution (0.7 µCi in 28 ml 0.9% NaCl) was instilled into the duodenum. By measuring the radioactivity of secretion aspirated from the stomach and intestine, 0-12% (mean 4.5%) and 11-97% (mean 49.8%), resp., of the ^{58}Co-labeled vitamin B_{12} was recovered. After i.v. administration of secretin, the enzyme output first increased above the basal value and then decreased. Enzyme output increased during infusion of secretin and pancreozymin and then remained almost constant. In controls, the bicarbonate output ranged from 12.4-43.1 mEq/hr (mean 23.1); the trypsin output, from 85-391 IU/min (mean 183); the chymotrypsin output, from 41-251 U/min (mean 102); the amylase output, from 440-2189 IU/min (mean 982); the lipase output, from 901-4865 IU/min (mean 2093); the protein output, from 0.48-4.76 g/hr (mean 1.51); and the bilirubin output, from 1.89-171.0 mg/hr (mean 18.0). Results of the secretin-pancreozymin test were abnormal in 62% of the patients recovering from acute pancreatitis, in all 48 patients with chronic pancreatitis; and in 10 of the 15 patients (66%) with juvenile diabetes. None of the 68 patients suspected of having pancreatic disease who had normal secretin-pancreozymin tests had pathological findings on endoscopic pancreatography. Of the remaining 33 patients with abnormal secretin-pancreozymin tests, 11 had radiological evidence of chronic pancreatitis; six had papillary stenosis and five, pancreatic cysts at surgery. Four patients had inoperable pancreatic carcinoma, and one young patient had cystic fibrosis which was diagnosed by determining sweat electrolytes.

3326 A BRITISH FAMILY WITH HEREDITARY PANCREATITIS. *(E.)* Sibert, J. R. (R. Victoria Infirm., Newcastle-upon-Tyne, England). *Gut* 16(2): 81-88, 1975.

A British family with hereditary pancreatitis was studied. The disease was definitely diagnosed in 9 members (by clinical signs, a raised serum amylase, or laparotomy, and once by pancreatic calcification seen radiographically) and was suspected in 15 others. The clinical signs included recurrent attacks of epigastric or central abdominal pain, sometimes radiating to the back, often associated with vomiting, and usually lasting 3-4 days. These attacks generally started in childhood or young adult life (mean age of onset in this group was 12.6 yr) and ceased by the age of 40. The pattern of inheritance in this family corresponds well with an autosomal dominant inheritance with incomplete penetrance, which agreed with previously reported families. However, unlike in some previous reports, there was no aminoaciduria in this particular family. It is suggested that hereditary pancreatitis may have been underdiagnosed in Great Britain, and the increased awareness may aid in the differential diagnosis of relapsing pancreatitis, especially in children and young adults.

3327 FRUSEMIDE-INDUCED PANCREATITIS. *(E.)* Jones, P. E.; Oelbaum, M. H. (Manchester North Hosp., London, England). *Br. Med. J.* 1(5950): 133-134, 1975.

A case of acute pancreatitis in which furosemide (frusemide) was implicated as the etiological agent was reported in a 64-yr-old female hospitalized with a myocardial infarction complicated by mild left ventricular failure. After receiving 80 mg/day furosemide for 4 weeks, the patient developed hiccuping, eructations, upper abdominal discomfort, and vomiting. Serum amylase was elevated (80 U/100 ml), as was the serum lipase (3.3 U/ml), and a diagnosis of acute pancreatitis was made. At the end of the seventh week the furosemide was stopped and within 36 hr the abdominal pain, vomiting, and eructation had eased considerably. The serum amylase and lipase began to fall, and a cholecystogram was normal. At the end of the 10th week furosemide was given again in a dose of 40 mg/day and the next day the epigastric pain and eructations returned. The serum amylase and lipase also increased. As before, when the furosemide was discontinued the clinical signs disappeared and the blood values began to return to normal. Thus it is suggested that the diuretic furosemide was responsible for the episodes of acute pancreatitis.

3328 INFLUENCE OF EXOCRINE AND ENDOCRINE PANCREATIC FUNCTION ON INTESTINAL BRUSH BORDER ENZYMATIC ACTIVITIES. *(E.)* Caspary, W. F.; Winckler, K.; Lankisch, P. G.; Creutzfeldt, W. (Dep. Med., Univ. Gottingen, Germany). *Gut* 16(2):89-92, 1975.

Digestive enzymatic activities (disaccaridases, alkaline phosphatase, peptide hydrolases) were studied in small bowel mucosal biopsies from 14 patients with chronic pancreatitis and 10 healthy controls. All chronic pancreatitis patients had abnormal secretin-pancreozymin tests, four had insulin-dependent diabetes mellitus, four had a pathological glucose tolerance test, and nine had steatorrhea. Multiple small bowel biopsies were obtained with a hydraulic biopsy tube under fluorscopic control beyond the ligament of Treitz after an overnight fast. All biopsies showed normal villous structure and light microscopy revealed no signs of mucosal atrophy or inflammation. Maltase, sucrase, and alkaline phosphatase activity was significantly elevated in the chronic pancreatitis patients, whereas lactase, trehalase, and peptide hydrolase activities were normal. Patients with steatorrhea had higher maltase and sucrase activity than those without steatorrhea, while decreased glucose tolerance had no effect on brush border enzymatic activity. It was suggested that decreased exocrine function, rather than decreased endocrine function, was responsible for the increase in intestinal disaccharidase and alkaline phosphatase activity, possibly by the influence of pancreatic enzymes on the turnover of brush border enzymes from the luminal side of the mucosal membrane or by direct hormonal stimulation through cholecystokinin.

3329 CLINICAL AND IMMUNOLOGICAL PARALLELS IN PATIENTS WITH PANCREATITIS AND CHOLECYSTITIS. *(Rus.)* Bordonos, V. G.; Reingardt, B. K.; Maltsev, V. N.; Khramov, A. V. (Kiev Med. Inst., USSR). *Vrach. Delo* (11):74-77, 1974.

Immunological studies were performed on 46 patients with acute and chronic pancreatitis, cholecystopancreatitis, acute cholecystitis and cancer of the pancreas. Autoantibodies to the pancreatic and hepatic tissues were identified by the passive hemagglutination (PHA) and complement fixation (CF) tests. The PHA test was considered positive in titers above 1/8; the CF test varied from weakly positive (+) to strongly positive (+++). The results showed that the highest titer of autoantibodies was observed on the second week after the aggravation of the disease. A correlation was found between the antibody titer and the severity of the disease. The CF test was positive in 22 of the 31 patients; the PHA test in 26 of the 40 patients. A case is reported of a 66-yr-old woman with acute pancreatitis, who on the third day of hospitalization had PHA at 1/32 and CF +++; on the

13th day, PHA 1/512 and CF +++; at the time of the discharge, PHA 1/128, CF +++. Some time later the patient had recurrent pancreatitis. The results indicate that autoantibody tests offer in some cases more reliable criteria to determine the onset of a complete remission. It is suggested that the identification of autoantibodies in the sera of patients with different forms of pancreatitis by PHA and CF tests should be part of clinical examination.

3330 THE EFFECT OF ACTIVE ELASTASE ON THE PANCREATIC TISSUE. *(Rus.)* Chernoiarova, O. D.; Podolskii, A. E. (Sci. Res. Inst. Gastroenterol., Moscow, USSR). *Biull. Eksp. Biol. Med.* 77(11):122-125, 1974.

Histological, histochemical and electron microscope studies of the pancreatic tissue were conducted. Female albino rats weighing 160-180 g were injected with 0.65 or 2.6 mg of elastase into the pancreatic duct; the animals were sacrificed at different intervals. It was found that elastase injection induced acute pancreatitis within 15 min accompanied by the reduction of the amount of proelastase in the tissue and decrease of the inhibitory activity of the serum. One hr after the injection, acute necrotic pancreatitis developed, accompanied by diapedetic hemorrhages into the perivascular space. An increase of the elastase dose to 2.6 mg resulted in the destruction of the elastic membrane of the vein wall. The data obtained suggest an important role played by elastase in the pathogenesis of acute pancreatitis.

3331 ACUTE PANCREATITIS. *(Fr.)* Hay, J. M.; Maillard, J. N. (no affil.). *Cah. Med.* 15(5):231-235, 1974.

3332 ACUTE PANCREATITIS IN RHODESIAN AFRICANS, WITH PARTICULAR REFERENCE TO THE PROBLEMS OF DIAGNOSIS. *(E.)* Wicks, A. C. B.; Fleming, J. B. M. (Harare Cent. Hosp., Rhodesia). *Cent. Afr. J. Med.* 20(6):115-119, 1974.

3333 EXPERIENCE WITH AND RESULTS FROM THE TREATMENT OF ACUTE PANCREATITIS. *(Ger.)* Kothe, W.; Schwokowski, C. F.; Albert, H.; Schauer, K. (Surg. Clin., Karl Marx Univ., Leipzig, Germany). *Zentralbl. Chir.* 99(39):1217-1224, 1974.

3334 GLUCAGON THERAPY OF PANCREATITIS. *(Ger.)* Fleischer, K.; Kasper, H. (Med. Clin., Univ. Wurzburg, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:870-873, 1973.

3335 EARLY DECOMPRESSION OF THE BILIARY TRACT IN ACUTE PANCREATIC NECROSIS. *(Ger.)* Werner, U.; Adler, G. G. (Friedrichshain Munic. Hosp., Berlin, Germany). *Zentralbl. Chir.* 99(39):1225-1232, 1974.

3336 SILENT ACUTE PANCREATITIS WITH ENCEPHALOMALACIA MIMICKING HEPATIC COMA. *(E.)* Cohen, L.; Sandbank, U.; Rosenfeld, J. B. (Tel Aviv Univ. Med. Sch., Israel). *Am. J. Gastroenterol.* 63(1):75-78, 1975.

3337 DISORDERS IN TRANSIT IN PANCREATITIS AND ACUTE PERITONITIS. *(Fr.)* Vignon, H. (no affil.). *Ann. Anesthesiol. Fr.* 15(Suppl. 1):86-91, 1974.

3338 ESTABLISHMENT OF MODELS FOR ACUTE AND CHRONIC PANCREATITIS. *(Rus.)* Dimenshtein, I. B. (Leningrad Munic. Outpatient Clin. Oncol., USSR). *Patol. Fiziol. Eksp. Ter.* (6):74-78, 1973.

3339 PERITONEAL DIALYSIS AS A POSSIBLE METHOD FOR TREATING ACUTE EXPERIMENTAL PANCREATITIS IN THE RAT. *(Ger.)* Winckler, R.; Lankisch, P. G.; Koop, H.; Schmidt, H. (Med. Clin., Univ. Gottingen, Germany). *Z. Gastroenterol.* 12(Suppl.):422, 1974.

3340 PATHOGENESIS OF GALLSTONE PANCREATITIS. *(E.)* Thurston, O. G. (Dep. Surg., Univ. Alberta, Edmonton, Canada). *Am. J. Surg.* 129(3):301-303, 1975.

3341 SPONTANEOUS RESOLUTION OF PANCREATIC MASSES (PSEUDOCYSTS?). DEVELOPMENT AND DISAPPEARANCE AFTER ACUTE ALCOHOLIC PANCREATITIS. *(E.)* Czaja, A. J.; Fisher, M.; Marin, G. A. (Philadelphia Gen. Hosp., Pa.). *Arch. Intern. Med.* 135(4):558-562, 1975.

3342 TRANSGASTRIC NEEDLE ASPIRATION OF PANCREATIC PSEUDOCYST THROUGH AN ENDOSCOPE. *(E.)* Rogers, B. H. G.; Cicurel, N. J.; Seed, R. W. (Grant Hosp., Chicago, Ill.). *Gastrointest. Endosc.* 21(3):133-134, 1975.

3343 THE INDUCTION OF SEGMENTAL PANCREATITIS IN THE RABBIT BY LIGATING THE CAUDAL PART OF THE PANCREATIC DUCT. *(Fr.)* Pietri, H.; Sahel, J. (Paoli-calmettes Inst., Marseille, France). *Biol. Gastroenterol. (Paris)* 7(4):320-321, 1974.

3344 α-AMYLASE ACTIVATION ENERGY AS A FUNCTION OF THE PANCREAS. *(Rus.)* Zabelinskii, E. K. (Leningrad Med. Inst. Sanit. Hyg., USSR). *Lab. Delo* (3):151-152, 1975.

3345 ISOENZYMES OF α-AMYLASE IN THE DUODENAL JUICE OF PATIENTS WITH PATHOLOGICAL PANCREAS AND ASSOCIATED ORGANS. *(Rus.)* Dykul', N. M. (Inst. Cytol. Genet., Novosibirsk, USSR). *Lab. Delo* (3):155-157, 1975.

3346 ENZYME SUBSTITUTION IN IMPAIRED DIGESTION. *(Ger.)* Beck, K. (German Diagn. Clin., Wiesbaden). *Z. Gastroenterol.* 13(Suppl.):171-188, 1975.

See also, 2574, 2861, 2872, 2876, 2882, 2907, 2909, 2910, 2912, 2961, 2962, 2966, 2967, 3106, 3111, 3280, 3312, 3604.

LIVER AND BILIARY TRACT

3347 INTRAHEPATIC ARTERIOVENOUS FISTULA RESULTING FROM NEEDLE BIOPSY: A CASE REPORT. *(E.)* Okuda, K.; Kotoda, K.; Igarashi, M.; Karasawa, E. (Chiba Univ. Sch. Med., Japan). *Acta Hepatogastroenterol. (Stuttg.)* 21(6):422-425, 1974.

A case report is presented in which an intrahepatic arteriovenous fistula developed in a 36-yr-old male alcoholic who had undergone needle biopsy approximately one month previously. On admission, coagulation studies were normal although several liver function tests, including total and direct bilirubin (1.7 and 1.0 mg%, resp.) were abnormal. The patient had radiologic evidence of cardioesophageal varices. Percutaneous needle biopsy of the liver was performed without incident. The specimen contained a small portion of parenchyma and a long segment of fibrous portal tract with some vessel wall tissue. Celiac angiography performed 4 weeks later revealed simultaneous opacification of a branch of the right hepatic artery and several portal vein branches. The contrast medium in the portal branches persisted for a few sec after disappearance of the arterial opacification. No bruit was audible over this area. The defect was seen in the same area in which the biopsy had been performed. The patient improved, was discharged after two months and has remained unchanged on follow-up examination. It is concluded that a post-biopsy hepatic arteriovenous fistula should be considered in anyone who manifests increased portal hypertension or from whom a large piece of portal tissue is obtained.

3348 DISCRIMINATIVE AND PROGNOSTIC SIGNS IN ACUTE HEPATIC COMA, TREATED BY EXCHANGE TRANSFUSIONS. *(E.)* Demedts, M.; De Groote, J.; Vandamme, B.; Desmet, V. J. (St. Rafael Acad. Hosp., Louvain, Belgium). *Digestion* 11(1/2):105-114, 1974.

Factors affecting prognosis were evaluated in 14 consecutive cases of hepatic coma. All patients were in coma, apparently due to acute viral hepatitis, for 6-36 hr prior to initiating treatment. This included multiple exchange transfusions with 3-7 liters fresh whole blood, prednisone (25-250 mg/day), correction of electrolyte imbalance, hydration, and other supportive therapy. Clinically, no distinction could be made between the encephalopathy exhibited by the 5 survivors and the 9 who died. Patients whose outcome was ultimately favorable responded with improved consciousness after 2-4 transfusions (3 days) and generally became fully alert within 6 days. Several, however, developed transient complications which included significant ascites (2), bleeding stress ulcers (2), and septicemia (1). Patients who eventually died showed a progressively deteriorating course with no response to transfusion. No patients who presented with severe dysrhythmias on EEG survived. Prior to exchange transfusion, patients who eventually died had higher mean arterial ammonia levels (0.28 mg% *versus* 0.16 mg%) and more prolonged prothrombin times (< 15% of control *versus* 5-50%) than did those who survived. Liver biopsy specimens from patients who died showed more extensive necrosis with interlobular confluence than did those from surviving patients. Biopsies taken up to 7 yr later from patients who survived showed no evidence of cirrhosis. It is thus concluded that assessment of EEG changes, arterial ammonia levels, prothrombin times and liver histology may be of prognostic value in patients with hepatic coma.

3349 BILE ACID KINETICS IN RELATION TO SEX, SERUM LIPIDS, BODY WEIGHTS, AND GALLBLADDER DISEASE IN PATIENTS WITH VARIOUS TYPES OF HYPERLIPOPROTEINEMIA. *(E.)* Hellstrom, K.; Kallner, M. (Serafim Hosp., Stockholm, Sweden). *J. Clin. Invest.* 54(6):1301-1311, 1974.

Fifteen normolipidemic and 61 hyperlipidemic subject/patients (35-67 yr, 23 with various gallbladder diseases and the rest with nongastrointestinal diseases or normal) were maintained on a standardized diet of the natural type for 4-7 days. Caloric intake was adjusted to keep the body weight constant. [^{14}C]Cholic acid (4 μCi) and [^{3}H]chenodeoxycholic acid (15 μCi), as sodium salts were dissolved in water and taken p.o. before breakfast. Four samples of duodenal bile were collected from each at 2-4 day intervals. Cholecystokinin was given i.v. and 5-10 ml concentrated duodenal bile obtained through a thin tube. The specific radioactivities of cholic acid and chenodeoxycholic acid were determined in each sample. Venous blood samples were drawn 4-6 times and analyzed for cholesterol, triglyceride, and lipoprotein pattern. The total bile acid formation was within normal limits in patients with hyperlipoproteinemia types IIa and IIb. The average production of cholic acid represented less than 50% of the total bile acid synthesis in both groups. The corresponding value for the controls was 64%. The synthesis of cholic acid in hyperlipoproteinemia type IIa was significantly below normal. Of the 27 patients with the type IV pattern, 18 had a synthesis of cholic acid and cholic acid + chenodeoxycholic acid that exceeded the upper range recorded for the controls. In these subjects the cholic acid formation represented 73% of the total bile acid synthesis. Similar findings were also encountered in 5 patients with the type V lipoprotein pattern. The bile acid pool size of the 11 patients with hyperlipoproteinemia type IV, who had been cholecystectomized or suffered from cholelithiasis, was 900 mg smaller than that of the other subjects with the same type of hyperlipoproteinemia. The pool size of the former subjects, however, still tended to be higher than that of the controls. In all groups, the formation of bile acids tended to be higher in males than in females. Bile acid synthesis showed no linear correlation to actual body weight, relative body weight, or body surface area. A moderate weight reduction in 5 patients was followed by a 50% reduction of the cholic acid and chenodeoxycholic acid synthesis. It is suggested that the abnormal low density lipoprotein metabolism in hyperlipoproteinemia type II is closely linked to abnormal bile acid kinetics which may or may not be the more fundamental defect. The mechanisms responsible for the accumulation of very low density lipoprotein in hyperlipoproteinemia type IV have not been established. The large bile acid pool size and the tendency to elevated fractional bile acid turnover in this disorder suggest a defect at the intestinal level.

3350 DISPOSABLE ORGAN CHAMBER FOR PERFUSION OF THE EX VIVO LIVER AND ITS USE IN THE TREATMENT OF HEPATIC COMA. *(E.)* Hanson, C.; Baker, P. R.; Cuschieri, A. (Dep. Surg., Univ. Liverpool, England). *Eur. Surg. Res.* 6(1):41-45, 1974.

Two female patients, one 50 yr old and the other 20, in hepatic coma were treated by extracorporeal hepatic assist using a plastic disposable organ chamber for the perfusion of the *ex vivo* liver. The organ chamber consisted of a 12-inch diameter plastic salad container and a 5.5-inch diameter plastic funnel. The liver was held in a 10-inch plastic colender and the entire chamber covered with a clear plastic lid. The entire organ chamber was siliconized prior to sterilization using acid glutaraldehyde. Using this organ chamber, hepatic assist of 3.5 hr duration was performed on the 50-yr-old patient when in stage IV coma. Blood ammonia was 300 μg/100 ml; total serum bilirubin was 4.3 mg/100 ml. A liver from an 18 kg pig was used, the circuit being primed with fresh human blood of the same blood group as the patient's. The estimated blood flow through the liver was low for the first 30 min, but thereafter averaged 300 ml/min. The patient recovered full consciousness within 18 hr of the assist, and her blood ammonia dropped to 64 μg/100 ml. She died of bronchopneumonia 14 days after the assist. The bronchopneumonia was believed not to be due to the porcine liver perfusion because the infection did not develop until 10 days later. It is suggested that the improvement in cardiac and renal function after assist in this patient may be due to removal of toxic metabolites by the porcine liver. The second patient, who was in an advanced degree of cirrhosis, was given hepatic assist for 3 hr eight days after a colonic by-pass operation. The same technique was used as for the first patient. The average liver blood flow during perfusion was 300 ml/min. The patient regained partial consciousness the following day and was fully conscious on the 4th day after the assist. Her blood ammonia decreased from a pre-assist level of 210 to 55 μg/100 ml 48 hr after perfusion. Severe jaundice continued, however, and serum bilirubin went to 30 mg/100 ml. Renal failure developed 12 days after the assist and she died on the 20th day. Although the patients died, the assist was considered successful because the patients regained consciousness shortly after the procedure. According to the authors this disposable organ chamber has several advantages: 1) venous outflow from the perfused liver is unimpeded and can be measured to provide an immediate assessment of the efficiency of the perfusion; 2) the colender provides greater maneuverability of the liver within liver chamber; and 3) connection of the cannulae is a quick and easy process.

3351 ERYTHROCYTOSIS IN HEPATOCELLULAR CARCINOMA: A COMPENSATORY PHENOMENON. *(E.)* Tso, S. C.; Hua, A. S. P. (Dep. Med., Univ. Hong Kong, Queen Mary Hosp.). *Br. J. Haematol.* 28(4):497-503, 1974.

Nine patients with erythrocytosis complicating hepatocellular carcinoma were studied to determine whether erythropoetin or its precursor was autonomously produced by the tumor. At least two plasma samples and three consecutive 24-hr urine samples were collected prior to phlebotomy, and more samples were taken for 3 days after phlebotomy. Plasma was assayed for erythropoetin with hypertransfused plethoric mice and the pH, volume, and creatinine concentration of the urine were determined. For comparison, plasma samples were collected from three polycythemia vera patients before and after phlebotomy. Plasma and urine samples were also collected from two normal subjects and three with gastrointestinal bleeding. Plasma erythropoetin levels rose following phlebotomy in seven patients, in three of which the rise was significant. In contrast, no rise was seen in the polycythemia vera patients. None of the carcinoma patients showed a significant rise in urinary erythropoetin output after phlebotomy. The gastrointestinal patients showed a fluctuating but definite elevation of erythropoetin activity in both plasma and urine. It is suggested that the increased erythropoetin levels and resultant erythrocytosis are compensatory in nature rather than autonomous.

3352 HEMOCHROMATOSIS: PATHOPHYSIOLOGIC AND GENETIC CONSIDERATIONS. *(E.)* Ross, C. E.; Muir, W. A.; Ng, A. B. P.; Graham, Jr., R. C.; Kellermeyer, R. W. (Univ. Hosp. Cleveland, Ohio). *Am. J. Clin. Pathol.* 63(2):179-191, 1975.

Two families with idiopathic hemocromatosis were studied with respect to the mechanisms of pathogenesis and genetics. In addition to routine hematologic studies, erythrocyte incorporation and uptake studies were performed with ^{59}Fe, and biopsies of bone marrow and liver were stained with hematoxylin and eosin, trichrome, and prussian blue. Electron microscopic studies were also done. In one family only the proband and an older sister showed any evidence of hemochromatosis. The sister died at the age of 23 from the disease, and the proband at the age of 16 showed unmistakable pathological changes. Findings in both included normal or slightly altered liver architecture with some portal fibrosis. There was marked deposition of iron in the hepatic cells, but little or none in the Kupffer cells. In the older sister, cirrhosis was evident, and iron was found in the pancreas in moderate amounts, but only trace amounts were found in the spleen. Bone marrow iron was normal or decreased. In the second family, seven members showed evidence of hemochromatosis. The ages of those with high hepatic cell iron ranged from 27 to 52. Findings included mild portal and interlobular fibrosis, concentration of iron in the hepatic cells, and only trace amounts in the Kupffer cells. The autopsies of the four iron overload cases, in contrast, showed high concentrations of iron in the Kupffer cells with smaller amounts in the hepatic cells, and the splenic and marrow iron was equal to or greater than the hepatic iron. These observations support the view that there are two distinct forms of the disease: a severe autosomal recessive form; and a milder autosomal dominant form with a later onset. It is concluded that both types may be due to a similar defect in the reticulo-endothelial system that places an increased burden on the liver parenchyma cells.

3353 WILSON'S DISEASE. CLINICAL AND LABORATORY MANIFESTATIONS IN 40 PATIENTS. *(E.)*

Strickland, C. G. T.; Leu, M.-L. (Nav. Med. Res. Inst., Bethesda, Md.). *Medicine* 54(2):113-138, 1975.

The clinical and laboratory manifestations of Wilson's disease in 40 patients are reviewed. The 16 males had an earlier mean age at onset (12.2 yr) than did the 24 females (22.1 yr). The average age of the 18 patients who died was 19.1 yr. General symptoms and signs included Kayser-Fleischer rings (37), splenomegaly (21), hyperpigmentation of the legs (20), bleeding and easy bruising (17), edema (12), arthralgias (11) and jaundice (11). Four patients had severe liver failure. Commonly seen neurologic manifestations included poor coordination (28), psychological impairment (27), tremor (26), dysarthria (26), abnormal gait (25), rigidity (24), dementia (23), dystonia (23), drooling (22), choreoathetosis (12) and coma (12). All 40 patients had reduced ceruloplasmin (mean = 0.050 Ravin U). Serum copper was reduced (47 μg%) in all and urinary copper was elevated (344 μg/day) in 33 of the 34 patients tested. Pancytopenia was frequently found and was correlated with splenomegaly. Serum uric acid was decreased (2.5 mg%) in 25 of 32 while uric acid clearancewas increased (1.7 ml/min/1.73m^2) in 21 of 24. Creatinine clearance was reduced in 7 of 24 while cadmium clearance was slightly increased in 4 of 21 and phosphate clearance was markedly elevated in 8 of 22. Hyperaminoaciduria occurred in most patients who had recieved less than one yr of penicillamine treatment. Prothrombin time was the most commonly abnormal liver function test, prlonged in 26 of 33. Total serum proteins were reduced (≤ 6 mg%) in 9 of 31. Proteinuria was present in 13 of 38, three of whom also had hematuria. The varied manifestations of Wilson's disease are stressed; because of the genetic heterogeneity, it is cautioned that manifestations in different patients, from different families, and of different races may have minor variations

3354 COAGULATION FACTOR CONCENTRATE IN THE TREATMENT OF THE HAEMORRHAGIC DIATHESIS OF FULMINANT HEPATIC FAILURE. *(E.)*

Gazzard, B. G.; Lewis, M. L.; Ash, G.; Rizza, C. R.; Bidwell, E.; Williams, R. (King's Coll. Hosp., London). *Gut* 15(12):993-998, 1974.

Nine patients in fulminant hepatic failure were studied for their response to prophylactic infusion of a coagulation factor concentrate containing factors IX, X, II and a small amount of VII with or without heparin. All patients had prothrombin time ratios ≥ 2.2 on admission. Of five patients receiving factor concentrate without heparin, three developed fatal hematemesis and melena within 48 hr of initiation of therapy. All five died, four within one week and the last after 14 days. Extensive hepatic necrosis with gastrointestinal hemorrhage was the major necropsy finding in four. Of the four patients treated with coagulation factor concentrate plus heparin, only one had minor gastrointestinal bleeding. One patient survived and three died of respiratory complications. Coagulation and hematologic profiles did not deteriorate as markedly in the group receiving heparin supplemental therapy. In both groups, clotting factor assays showed increased factor II levels, small changes in factor IX and X levels and uniformly low factor V levels. Factor VIII levels dropped rapidly in patients receiving factor therapy without heparin but did not change appreciably in patients receiving heparin. It is thus concluded that factor IX concentrate cannot presently be recommended in the treatment of bleeding diathesis associated with hepatic failure because of its inability to correct factor deficiency and its possible aggravation of intravascular coagulation.

3355 SHORT-CHAIN ORGANIC ACIDEMIA AND REYE'S SYNDROME. *(E.)*

Trauner, D. A.; Nyhan, W. L.; Sweetman, L. (Univ. Calif. San Diego, La Jolla). *Neurology (Minneap.)* 25(3):296-298, 1975.

Short-chain fatty acid levels were determined using gas-liquid chromatography prior to initiation of therapy in seven patients with Reye's syndrome. Blood samples taken within 24-48 hr after the onset of symptoms showed 3-20-fold elevations in propionate, butyrate and isobutyrate compared to control subjects with no known liver disease. No consistent correlation was found between the concentration of any of the short-chain fatty acids and the eventual clinical outcome. These findings are consistent with previous reports showing elevated total free fatty acids in patients with Reye's syndrome and suggest that certain short-chain fatty acids may play a role in the clinical manifestations of the syndrome.

3356 FASTING SERUM BILE ACID LEVELS IN THE PRIMARY HYPERLIPOPROTEINEMIAS.

(E.) Korman, M. G.; Ellefson, R. D.; Hofmann, A. F. (Mayo Grad. Sch. Med., Rochester, Minn.). *Mayo Clin. Proc.* 50 (2):76-78, 1975.

Fasting serum levels of cholic acid conjugates were measured in 126 males and 107 females with various types of hyperlipoproteinemia by radioimmunoassay. Subjects with type IIa hyperlipoproteinemia had significantly lower levels of cholic acid conjugates (0.10 μM) than did 80 healthy controls (0.50 μM). Patients with type IIb, III, IV and V hyperlipoproteinemia had values similar to those of the control group. The abnormally low fasting value of c[illegible] acid conjugates in type IIa patients is considered to reflect decreased secretion of bile acid into the intestine in such patients, who are known to have defective bile acid synthesis rates and decreased bile acid pool sizes.

3357 COMPARISON OF THE EFFECTS OF TOTAL PARENTERAL NUTRITION, CONTINUOUS INTRAGASTRIC FEEDING, AND PORTACAVAL SHUNT ON A PATIENT WITH TYPE I GLYCOGEN STORAGE DISEASE.

(E.) Burr, I. M.; O'Neill, J. A.; Karzon, D. T.; Howard, L. J.; Greene, H. L. (Vanderbilt Univ. Sch. Med., Nashville, Tenn.). *J. Pediatr.* 85(6):792-795, 1974.

Clinical status, blood chemistry and platelet function were assessed in a 16-yr-old male with type I glycogen storage disease who was treated with parenteral nutrition, continuous intragastric feeding and portacaval shunt. At the time therapy was initiated the patient had marked hepatomegaly, multiple bruises, fasting hypoglycemia, elevated serum lipids, uric acid and lactic acid, a reduced response to glucagon stimulation, decreased glucose-6-phosphatase activity in a liver biopsy specimen, and abnormal platelet function. Treatment by parenteral nutrition for 21 days resulted in transiently decreased liver size, a return of blood chemistry values toward normal, and normalization of ADP-mediated platelet aggregation. Retreatment six weeks later by continuous intragastric feeding again produced marked improvement in the biochemical profile and in platelet function and a decrease in liver size. On the 23rd day of intragastric feeding, the patient underwent an end-to-side portacaval shunt. Although post-operative uric acid levels and platelet function returned to pretreatment values and hypoglycemic symptoms returned with strenuous exercise and fasting beyond 6 hr, the patient experienced no significant bleeding episodes and grew 4 inches in 5 months. These results indicate that continuous nutrition *per se* will revert the anomalies associated with type I glycogen storage disease and are in agreement with those of previous studies.

3358 CHOLESTASIS IN IMMATURE NEWBORN INFANTS: IS PARENTERAL ALIMENTATION RESPONSIBLE?

(E.) Rager, R.; Finegold, M. J. (Bellevue-New York Univ. Med. Cent. N.Y.). *J. Pediatr.* 86(2):264-269, 1975.

The effect of parenteral alimentation on the development of intrahepatic cholestasis was investigated retrospectively in nine of 15 premature infants (≤ 30 week gestation, birth weight 1250 g) who survived at least 5 days. The nine, who were shown at autopsy to have cholestasis, were compared with the remaining six who did not have cholestasis. All 15 babies who also had respiratory distress, hemorrhage or infection, were maintained by total i.v. hyperalimentation (90 cal/kg in 150 mg/day). Only three of the nine cholestatic patients received some oral nutrition during the first 10 days whereas four of the six noncholestatic patients were successfully fed p.o. during the initial week. None of the affected patients was able to sustain oral or nasogastric feeding during the first 17 days. The fact that cholestasis was seen in one patient fed p.o. except for the last 3 days of life and that cholestasis did not develop in one patient maintained for 20 days on hyperalimentation after 10 days of oral feeding suggested no correlation between the hyperalimentation and cholestasis. Increasing survival did not result in progressive liver disease. It is concluded that early fasting rather than parenteral supplementation may contribute to the development of cholestasis in the small premature infant.

3359 ALPHA-1-ANTITRYPSIN IN DUODENAL FLUID AND GALLBLADDER BILE.

(E.) Kyaw-Myint, T. O.; Howell, A. M.; Murphy, G. M.; Anderson, C. M. (Inst. Child Health, Univ. Birmingham, England). *Clin. Chim. Acta* 59(1):51-54, 1975.

α_1-Antitrypsin concentrations were determined by electroimmunoassay in duodenal fluid from 16 patients aged 7 days to 7 yr being investigated for various gastroenterological problems. In addition, gallbladder bile obtained from five patients post mortem and from one patient at laparotomy was investigated. α_1-Antitrypsin (5.6-32.0 mg%) was detected in 20 of 26 fasting and pancreozymin-stimulated duodenal samples from 13 patients. Concentrations were significantly lower in children with liver disease than in those with extrahepatic diseases. All samples had some degree of trypsin inhibitory capacity which did not correlate with the α_1-antitrypsin concentration. α_1-Antitrypsin (8-40 mg%) was also detected in all bile samples except one from a patient with complete extrahepatic obstruction. Thus, unlike its activity in human serum, α_1-antitrypsin makes only a small contribution to the trypsin inhibitory activity of duodenal contents. The results are consistent with a model in which α_1-antitrypsin is delivered from the liver to the small intestine *via* the bile.

3360 HEPATIC DUCTULAR HYPOPLASIA ASSOCIATED WITH CHARACTERISTIC FACIES, VETEBRAL MAL-

FORMATIONS, RETARDED PHYSICAL, MENTAL, AND SEXUAL DEVELOPMENT, AND CARDIAC MURMUR. *(E.)* Alagille, D.; Odievre, M.; Gautier, M.; Dommergues, J. P. (INSERM, Parrot Hosp., Bicetre, France). *J. Pediatr.* 86(1): 63-71, 1975.

The clinical, biologic and histologic features of a group of 15 patients aged 1-21 yr with hepatic ductular hypoplasia and normal extrahepatic bile ducts are presented. These patients were selected from a larger group of 30 with ductular hypoplasia seen over a 18-yr period. The earliest manifestation of the disease, which is equally prevalent in males and females, was persistent cholestasis seen during the first 3 months of life. Moderate elevations in serum bilirubin concentration were associated with intense pruritus and hepatosplenomegaly even in the absence of portal hypertension. Later in the course of the disease, serum lipids and cholesterol rose to extremely high values and alkaline phosphatase increased 3- to 5-fold. Histologically, bile ducts were absent from most portal triads and mild periportal fibrosis was sometimes present. Other characteristics of the syndrome included: 1) characteristic faces with a prominent forehead, deeply set eyes, a straight nose and a small, pointed chin seen in all 15 patients; 2) a harsh midsystolic murmur over the pulmonic area heard in 12; 3) vertebral arch defects demonstrated in eight; 4) growth retardation in eight; 5) mental retardation (IQ = 60-80) in nine; and 6) hypogonadism in six males, five of whom had high circulating plasma testosterone levels. Family histories positive for neonatal cholestasis among siblings were obtained in three cases. Only two patients died, each without liver failure, and follow-up data indicate that this condition carries a better prognosis than do other types of intrahepatic cholestasis.

3361 THE EFFECT OF LIVER DISEASE IN MAN ON THE DISPOSITION OF PHENOBARBITAL. *(E.)* Alvin, J.; McHorse, T.; Hoyumpa, A.; Bush, M. T.; Schenker, S. (Vanderbilt Univ. Sch. Med., Nashville, Tenn.). *J. Pharmacol. Exp. Ther.* 192(1):224-235, 1975.

The disposition of phenobarbital was studied in eight normal individuals and in nine patients with cirrhosis and eight patients with acute viral hepatitis. Diagnoses were established by appropriate laboratory and pathologic studies. All subjects had normal renal function and were free of alchohol or other drug ingestion for at least 3 weeks. Following a 12-hr fast, ^{14}C-phenobarbital (0.85 mg/kg, 50 μCi) was administered by duodenal intubation. ^{14}C-Labeled phenobarbital and its principal metabolites, *p*-hydroxyphenobarbital (PBOH) and conjugated *p*-hydroxyphenobarbital (PBOC), were identified and quantitated by chromatographic methods in blood and urine for 5 days. Phenobarbital blood half-life in the control group was prolonged to 130 hr ($P < .05$). No PBOH and only traces of PBOC were detected in the blood of either control individuals or patients with liver disease. Urinary excretion of unchanged phenobarbital was an important elimination pathway of the drug in all groups. As a result of this, phenobarbital blood half-life in cirrhosis was only moderately prolonged. Thus, phenobarbital may be a reasonable choice as a sedative in cirrhosis patients.

3362 EARLY DIAGNOSIS OF LIVER METASTASES: AN EVALUATION OF THE INDIVIDUAL DIAGNOSTIC PROCEDURES. *(Ger.)* Sabitzer, H.; Deimer, E.; Hohenberg, G.; Wickenhauser, J. (Radiother. Inst., Univ. Vienna, Austria). *Wien. Klin. Wochenschr.* 86(19): 573-577, 1974.

Different diagnostic procedures in the early diagnosis of liver metastases are evaluated on the basis of 406 cases in which different diagnostic techniques and their combinations were applied, and a step-by-step diagnostic procedure is proposed. Liver function tests and scintigraphic tests are performed first, after which ultrasonic technique is applied in suspect and positive cases. Biopsy is indicated in suspect diffuse hepatic alterations. Laparoscopy and angiography are recommended if nodular alterations are suspected. Angiography is a method of choice especially in the case of hypervascularized tumors. Liver enzyme and scintigraphic tests suggested metastases in 69 cases. Alkaline phosphatase, leucin arylamidase, and γ-glutamyl transpeptidase tests were found to be the most relevant of all enzyme tests for the diagnosis of liver metastases. The enzyme test results were correct in 68.1% of the 69 cases, and wrong in 17.4%. The scintigraphic findings were correct in 62.3% of the 69 cases, and false-positive or negative in 30%. The ultrasonic test results were correct in 71%, and false-positive or negative in 21%. Arteriography, performed in nine patients, gave correctly positive results in three cases, four correctly negative results in four cases, and one false-positive and negative result in one case each. Metastases were ruled out by laparoscopy correctly in six of nine cases, and confirmed in two cases, while metastases were found in one patient with negative laparoscopic findings at a follow-up after 3 months. All findings from all diagnostic tests were consistent in 16 cases.

3363 BILE ACIDS AND BILE ACID SULFATES IN THE SKIN OF PATIENTS WITH CHOLESTASIS AND PRURITUS. *(Ger.)* Stiehl, A. (Med. Clin., Univ. Heidelberg, Germany). *Z. Gastroenterol.* 12(2):121-124, 1974.

Sulfated and nonsulfated bile acids were extracted from the serum, urine, and skin of seven patients with cholestasis and pruritus and of five controls with cholestasis but not pruritus. Bile acids were fractionated on Sephadex LH-20, taurine and glycine conjugates were hydrolyzed enzymatically, and sulfate esters were subjected to solvolysis before quantitative analysis with gas chromatography. No significant difference was found between total serum or urinary bile acids in patients with cholestasis and pruritus and in those with cholestasis alone. However, bile acids were significantly increased in the skin of patients with cholestasis and pruritus. The content of sulfate esters of bile acids was low in the skin of both groups. In patients with cholestasis and pruritus, cholic acid was present in the highest concentration in the serum, while chenodeoxycholic acid was found in the highest concentration in the skin. In two of five controls, urinary bile acid excretion was increased to 150 mg/24 hr. Since both serum and skin bile acid contents were significantly lower than in patients with cholestasis and pruritus, it is suggested that the large amounts of bile acids excreted in the urine of these patients prevented pruritus from developing.

3364 LAPAROSCOPIC FINDINGS IN ERYTHROPOIETIC PROTOPORPHYRIA. *(Ger.)* Solis-Herruzo, J. A.; Perez-Pena, F. (Med. Clin., Univ. Madrid, Spain). *Z. Gastroenterol.* 12(5):335-340, 1974.

A 25-yr-old man was diagnosed as having erythropoietic protoporphyria on the basis of characteristic skin lesions; deposits of PAS-positive, amylase-resistant hyaline material in the perivascular region of the skin; transitory red fluorescence of RBC in the peripheral blood and a bone marrow biopsy; a positive Rimmington and Cripps fluorescence test in the blood; and normal urinary excretion of prophobilinogen, coproporphyrin, and uroporphyrin. At laparoscopy the entire surface of the liver appeared to be uniformly covered with small granules as in nodular cirrhosis. The parenchyma was bluish-gray in color, similar to that in patients with Dubin-Johnson syndrome, but this diagnosis was ruled out by cirrhosis, the distribution of pigment in the liver, and histochemical analysis of the pigment. No green color suggestive of intrahepatic cholestasis was present. Examination of a liver biopsy showed dilatation of the portal fields with fibrous septa and regenerative nodules. Hepatocytic degeneration and necrosis were evident, and many liver cells contained small quantities of bilirubin. Reddish-brown islets of pigment appeared in the intercellular space, hepatocytes, and bile ducts where they formed thrombi. This pigment showed red fluorescence under UV light. Samples of lyophilized liver contained large quantities of protoporphyrin (573 μg/g) along with coproporphyrin (28 μg/g) and other porphyrins (20 μg/g).

3365 SULFATED AND NONSULFATED BILE ACIDS IN URINE, SERUM, AND BILE OF PATIENTS WITH HEPATOBILIARY DISEASES. *(E.)* Makino, I.; Hashimoto, H.; Shinozaki, K.; Yoshino, K.; Nakagava, S. (Hokkaido Univ. Sch. Med., Sapporo, Japan). *Gastroenterology* 68(3):545-553, 1975.

The concentrations of sulfated and nonsulfated bile acids in the serum, urine, and bile were studied in patients with hepatobiliary diseases and normal subjects. Large amounts of bile acid sulfate were found in the urine of the hepatobiliary disease patients. In patients with acute hepatitis, the daily urinary excretion of bile acid was 68.24 μM/day and the percentage of sulfated bile acid was 83.4%. In patients with chronic hepatitis and cirrhosis, a slight increase in urinary bile acid over normal values was observed (2.89 and 5.27 μM/day, resp.) and the percentage of bile acid was 73.9% and 30.4%, resp. In patients with obstructive jaundice, urinary bile acid was moderately increased (32.62 μM/day) and the percentage of sulfated bile acid was 58.3%. In the hepatobiliary disease patients, the levels of both sulfated and nonsulfated bile acids in the serum were elevated over normal levels. The percentage of sulfated bile acid in normal serum was 9%, and it varied from 0-8218% in the pathological sera. Sulfated bile acid was markedly increased in the sera of patients with obstructive jaundice and acute hepatitis, while chronic hepatitis and cirrhosis were associated with a moderate increase. Large amounts of nonsulfated bile acid were found in all bile acids, but sulfated bile acid appeared only in very small amounts (below 0.5%). The findings suggest that the increased bile acid in the serum of patients with hepatobiliary disease might be more easily excreted in the urine as sulfated bile acid. The results provide no indication of a differential diagnostic significance of sulfated bile acid in various hepatobiliary diseases.

3366 LIVER INCLUSIONS IN ERYTHROPOIETIC PROTOPORPHYRIA. *(E.)* Wolff, K.; Wolff-Schreiner, E.; Gschnait, F. (Dep. Dermatol. I, Univ. Vienna, Austria). *Eur. J. Clin. Invest.* 5(1):21-26, 1975.

Liver histology was studied in two patients, a 21-yr-old man and a 36-yr-old woman, with erythropoietic protoporphyria. Both patients had markedly elevated protoporphyrins, considerable fluorescence and photohemolysis of RBC, but no porphyrinuria. Liver biopsy specimans from both patients obtained on two separate occasions each showed moderate fatty changes, portal inflammation and incipient fibrosis, and occasional focal cell necrosis. The cytoplasm of both hepatocytes and Kuppfer cells contained brown pigment granules which were birefingent and highly fluorescent. On electron microscopy, these granules were composed of straight or slightly curved needle or rod-like crystals 0.04-0.5 mμ long and 70-130 Å wide. The crystals were free in the cytoplasm or were ocassionally within autophagosomes of hepatocytes and were within membrane-delimited phagosomes of Kuppfer cells. The specimens from one patient also exhibited non-membrane-bound paracrystalline bodies within the cytoplasm of hepatocytes and occasionally within extracellular spaces. Needle-like granules such as those seen in the livers of both of these patients have not been reported in patients with porphyria cutanea tarda or other hepatic diseases; thus they may be characteristic for protoporphyric liver disease. The paracrystalline bodies seen in the second patient are, on the other hand, identical to the paracrystalline bodies which have been reported in rare individuals with Wilson's disease, porphyria cutanea tarda, and other liver conditions. These bodies may reflect, in a nonspecific way, a disturbance of hepatocyte function.

3367 BIOCHEMICAL FEATURES OF LIVER LESIONS IN PATIENTS WITH COLLAGEN DISEASES. *(Rus.)*

Pankina, V. Kh. (Inst. Rheum., Moscow, USSR). *Klin. Med. (Mosk.)* 52(7):56-60, 1974.

Studies were made of hepatospecific serum enzymes in 110 collagen patients (59 with rheumatism, 25 with lupus erythematosis, 26 with scleroderma and 25 healthy people). The results showed that all the patients had significant changes in the activity of the enzyme specific for liver pathology. In patients with rheumatism, the activities of histidase and urocanase averaged 1.9 and 3 μM, resp. It is indicated that enlargement of the liver was observed in five of the 44 adult patients, while organospecific enzymes were recorded in 22 cases. In 15 children with rheumatism, the activity of histidase and urocanase prior to chemotherapy was 2.8 and 3.2 μM. After the treatment the enzyme activity returned to normal. In the adults, histidase decreased from 1.6 to 1.1 M, while urocanase activity did not change. Histidase and urocanase activity was elevated in 80% of the lupus erythematosis patients to 2.5 and 4.5 μM, resp. Correlation was observed between enzyme activity and severity of the disease. Liver pathology was found in 80% of the scleroderma patients (histidase 3.0 μM; urocanase 2.3 μM). It is concluded that enzyme activity is indicative of liver pathology in collagen patients with no clinical signs. It is suggested that liver pathology may not be the result of the use of chemotherapeutic agents.

3368 METASTATIC CARCINOMATOSIS OF THE LIVER MIMICKING CIRRHOSIS: CASE REPORT AND REVIEW OF THE LITERATURE. *(E.)*

Borja, E. R.; Hori, J. M.; Pugh, R. P. (Cancer Res. Cent., Columbia, Mo.). *Cancer* 35(2):445-449, 1975.

The case of a 46-yr-old woman with breast carcinoma presenting with ascites, jaundice, spider angiomas, and portal hypertension is reported. On hepatic scan, the liver appeared to be almost the same size as the spleen, a finding frequently seen in cirrhosis. A program of treatment with 5-fluorouracil, cyclophosphamide, prednisone, methotrexate, and triiodothyronine was initiated; furosemide was also given for the ascites. The program was of no benefit and the patient died a few days later from uncontrolled esophageal bleeding. Microscopic examination of the liver at autopsy disclosed metastatic, poorly differentiated adenocarcinoma, similar in pattern to that in a breast biopsy sample. Intense stromal fibrosis and intravascular tumor infiltration with compression of the blood vessels, mainly of the portal system, was also seen. In addition, there was microscopic evidence of tumor invasion of the left breast, right axillary nodes, lungs, adrenal glands, and bone marrow. Five other cases resembling cirrhosis due to breast carcinoma are reported in the literature. The clinical pictures in all 6 cases were similar, with uncontrolled esophageal bleeding being the terminal event in each instance. In 5 of the 6 cases, the liver was larger than normal, and the characteristic histologic feature was the intense, diffuse fibrosis of the liver parenchyma. Type IV mammary carcinoma characterized by widespread metastases and a rapidly fatal course was seen in all cases. Although aggressive therapy directed against the malignant process might alter the course of this invariably fatal complication, there seems little indication for aggressive surgical management of the resulting portal hypertension.

3369 LIVER DISEASE IN RHEUMATOID ARTHRITIS AND SJØGREN'S SYNDROME. *(E.)*

Webb, J.; Whaley, K.; MacSween, R. N. M. Nuki, G.; Dick, W. C.; Buchanan, W. W. (R. Infirm., Glasgow, Scotland). *Ann. Rheum. Dis.* 34(1):70-81, 1975.

The frequency of 2 serological markers of hepatic disease, mitochondrial antibody and smooth muscle antibody, and the frequency of abnormal laboratory tests of hepatic function were prospectively evaluated in 216 patients with rheumatoid arthritis, 32 patients with Sjogren's syndrome, 27 patients with the sicca syndrome, and 289 patients with osteoarthrosis or a form of seronegative polyarthropathy. The highest frequencies of raised serum alkaline phosphatase levels and abnormal BSP excretion tests were found in the Sjogren's syndrome, rheumatoid arthritis, and sicca syndrome patients; most of the mitochondrial antibody, salivary duct antibody-, and smooth muscle antibody-positive patients were also within these disease groups. Among the patients with Sjogren's syndrome, rheumatoid arthritis, and the sicca syndrome, the prevalence of raised serum alkaline phosphatase and glutamic oxaloacetic transaminase levels, abnormal BSP excretion tests, hepatomegaly, and splenomegaly was significantly greater in those who were positive for mitochondrial antibody. Patients with smooth muscle antibody had a greater prevalence of abnormalities of all liver function tests, rheumatoid factor, mitochondrial antinuclear, and salivary duct antibodies, and hepatomegaly than those who were smooth muscle antibody-negative. In rheumatoid arthritis, higher serum alkaline phosphatase levels were correlated with higher articular indices, erythrocyte sedimentation rate (ESR), and serum globulin levels. The obverse was true of patients with sicca syndrome, in whom higher serum alkaline phosphatase levels were correlated with higher BSP excretion values. Higher BSP excretion values also correlated with longer disease duration, higher ESR, and higher serum alkaline phosphatase levels in patients with rheumatoid arthritis and Sjogren's syndrome. Screening for smooth muscle antibody and mitochondrial antibody should provide a useful indication of underlying or associated liver disease in rheumatoid arthritis and other collagenoses.

3370 HODGKIN'S DISEASE AND THE LIVER. *(E.)*

Cowan, R.; Trounce, J. R. (Greenwich Hosp. Gastrointest. Unit, London, England). *Guys Hosp. Rep.* 122(384):221-230, 1973.

Two patients who developed jaundice during the course of Hodgkin's disease are described to illustrate some of the difficulties encountered in the diagnosis and managment of this complication. Although the symptoms of liver disease were clear in both patients (2 men, aged 49 yr and 19 yr, resp.) seriously defective blood coagulation in both cases ruled out liver biopsy, laparoscopy, and laparotomy. The indirect methods of assessing liver disease by liver function tests had considerable limitations, largely because of the lack of specificity of such tests. In both patients, the most unequivocal evidence for liver involvement was a raised level of conjugated bilirubin associated with bilirubinuria, which indicated simply that the liver was abnormal. In general, a marked rise in hepatic transaminases indicates that dead or damaged hepatocytes are leaking their intracellular enzymes into the extracellular fluid; a fall in transaminases indicates that dead or damaged hepatocytes are leaking their intracellular enzymes into the extracellular fluid; a fall in transaminases may indicate overwhelming damage to the liver cell mass. Alkaline phosphatse is a useful indicator of early or focal infiltration of the liver and at such time is commonly the only abnormal liver function parameter. BSP and indocyanine green excretion tests may be used in the serial assessment of overall liver function. Isotope scanning of the liver is useful in visualizing discrete intra-hepatic lesions, and many conditions may be detected as focal abnormalities by this technique. Although liver biopsy has the most diagnostic potential of any test discussed, it requires that the patient have adequate clotting factors. With the availability of effective therapeutic agents for Hodgkin's disease, hepatic involvement should be evaluated and its progress followed carefully. Combination chemotherapy is the best form of drug treatment available, but irradiation of the liver also has a place in the treatment of liver involvement by Hodgkin's disease.

3371 REVERSAL OF SEVERE FATTY HEPATIC INFILTRATION AFTER INTESTINAL BYPASS FOR MORBID OBESITY BY CALORIE-FREE AMINO ACID INFUSION. *(E.)*

Heimburger, S. L.; Steiger, E.; Lo Gerfo, P.; Biehl, A. G.; Williams, M. J. (Keesler Air Force Base, Miss.). *Am. J. Surg.* 129:229-235, 1975.

The successful nonoperative treatment of 3 women in whom fatty metamorphosis developed in the liver after jejunoileal bypass for morbid obesity is reported. In 3 of 13 patients who underwent 6-12 in jejunoileal bypass procedures, symptomatic hepatomegaly developed with near total replacement of the hepatocytes by massive fatty infiltration. After undergoing liver scan, liver biopsy, and liver function tests, the patients were started on a peripheral infusion of 4.45% crystalline amino acid solution (2, l/day), which allowed for fat mobilization while preserving body protein stores. At the end of a 14-21 day infusion period, the serum albumin levels increased by 1 g in all 3 patients; decreases in liver volume of 83, 45, and 40% were also observed. During the infusion period, ketonuria was 4+ in all patients, indicating active lipolysis. Weight losses of 17, 19, and 40 lb occurred. All patients showed marked symptomatic improvement, and postinfusion liver biopsy specimens showed a return to near normal architecture. During a subsequent 5-7 month follow-up period, normal liver size was maintained by a high-protein, low-carbohydrate diet. Hepatic fatty infiltration complicating jejunoileal bypass can be massive and may require restoration of gastrointestinal continuity. This fatty infiltration appears to be caused by protein depletion associated with adequate or high carbohydrate intake. In contrast to standard hyperalimentation solutions, the use of calorie-free amino acid solutions reverses the hepatic infiltration by mobilization of fat. This fat mobilization does not occur as readily in the presence of large amounts of glucose.

3372 IRON ABSORPTION IN NORMAL SUBJECTS AND PATIENTS WITH IDIOPATHIC HAEMOCHROMATOSIS: RELATIONSHIP WITH SERUM FERRITIN CONCENTRATION. *(E.)*

Walters, G. O.; Jacobs, A.; Worwood, M.; Trevett, D.; Thomson, W. (Welsh Natl. Sch. Med., Cardiff). *Gut* 16(3):188-192, 1975.

The relationship between iron stores and iron absorption was studied in 52 healthy adults (22 women) and 15 patients (14 men) with primary idiopathic hemochromatosis. Iron absorption was measured by whole body counting using a flat bed scanning technique; measurements were made before, immediately after, and 14 days after consumption of chicken soup containing 2 mg iron and 0.5 μCi (^{59}Fe) ferric citrate. Iron stores were measured by determination of the serum iron concentration. In the normal subjects, there was a significant negative correlation between serum ferritin concentration and iron absorption; there was no correlation between iron absorption and hemoglobin concentration, serum iron concentration, or transferrin saturation. The mean iron absorption in the normal subjects was 12.6%, and that in the hemochromatosis patients was 2.19%. Although there was a significant negative correlation between serum ferritin concentration and iron absorption in the patients, the mean iron absorption (30%) in patients with normal ferritin concentration was significantly higher than the mean absorption in normal subjects with similar ferritin concentrations. Thus, iron absorption in the hemochromatosis patients corresponded to normal levels only when the serum ferritin concentration was significantly elevated above normal values. In the patients, there was a correlation between chelatable iron and serum ferritin concentration, but not between iron absorption and chelatable iron. The ratio of chelatable iron to ferritin was positively correlated with iron absorption. The data confirm the high iron absorption in hemochromatosis patients in relation to their iron load and support the view that this is associated with an imbalance between chelatable iron and ferritin synthesis.

3373 CANCER OF THE BILE DUCTS ASSOCIATED WITH ULCERATIVE COLITIS. *(E.)* Akawari, O. E.; Van Heerden, J. A.; Fould, W. T.; Baggenstoss, A. H. (Mayo Clin., Rochester, Minn.). *Ann. Surg.* 181(3): 303-309, 1975.

Thirteen cases of bile duct cancer associated with ulcerative colitis were reviewed. These cases represented 0.0062% of all autopsy cases at the Mayo Clinic in the period 1935-1973; they represented 1.6% of all autopsy cases of bile duct cancer in the same period. The mean age at onset of ulcerative colitis was 19 years, in each case the onset being marked by severe diarrhea. After initial severe symptoms, most patients developed a pattern of mild-to-moderate disease with exacerbations and remissions. In 10 patients, the ulcerative colitis was managed by various regimens aimed at symptomatic relief and support; proctocolectomy or total colectomy was performed in 3 cases. In one patient, ulcerative colitis was complicated by colonic cancer. The mean age at onset of symptoms of bile duct cancer was 38 yr. Mode of management of the preceeding colitis did not appear to affect the pattern of disease leading to the onset of bile duct cancer which was insidious in all cases. Symptoms included anorexia followed by progressive jaundice. The tumor had spread beyond the bile ducts in 10 patients by the time cancer was diagnosed. The tumors were difficult to identify and often infiltrated the hepatic hilus. Only 1 patient was considered suitable for curative resection; this patient survived for 31.3 months. Histologically, all patients had adenocarcinomas. In no instance was associated cholelithiasis present. The mean survival period was 18.8 months, with hepatic failure, sepsis, shock, and renal shutdown preceeding death. This series of patients combined with the cases reported in the literature suggest that the association between chronic ulcerative colitis and bile duct cancer is more than chance.

3374 FATTY ACID COMPOSITION OF LIVER TRIGLYCERIDES IN VARIOUS STAGES OF FAT DEPOSITION IN THE PARENCHYMA. *(E.)* Singer, P.; Gnauck, G.; Honigmann, G.; Stolz, P.; Schliack, V.; Thoelke, H.; Kettler, L. H.; Buntrock, P. (Clin. Diabetes Assoc. Dis., Berlin, Germany). *Acta Diabetol. Lat.* 11(1):32-42, 1974.

The relation between the fatty acid pattern of triglycerides, and fat droplet size in hepatocytes was investigated. Biopsy specimens were obtained from 30 diabetic inpatients. One part of each specimen was fixed in formalin for histological study, and the remainder was prepared for gas-liquid chromotography. Hepatocytes were classified into four stages according to fat droplet size, by means of an ocular net: normal (no droplets); small droplets (1.7-6.6 μm); medium droplets (7.9-24.0 μm); and large droplets (20.8-50.0 μm). With increasing droplet size a significant increase in palmitic acid (15.0%-28.7%) and oleic acid (19.3%-45.4%) was found. Significant decreases were found in arichidonic and eicosapentanoic acids (3.6%-0.4% and 25.6%-1.6%, resp.). There was also a slight decrease in myristoleic acid. It is concluded that oleic and palmitic acids are predominant in the fat deposited in the liver as well as adipose tissue.

3375 HEPATIC ARTERY LIGATION AND POSTOPERATIVE CHEMOTHERAPY FOR HEPATIC METASTASES: CLINICAL AND PATHOPHYSIOLOGICAL RESULTS. *(E.)* Sparks, F. C.; Mosher, M. B.; Hallauer, W. C.; Silverstein, M. J.; Rangel, D.; Passaro, Jr., E.; Morton, D. L. (Sepulveda VA Hosp., Los Angeles, Calif.). *Cancer* 35(4):1074-1082, 1975.

The effect of a combination of hepatic artery ligation and postoperative chemotherapy on 19 patients with multiple bilateral unresectable metastases, limited to the liver was investigated. In 13 patients the metastases originated from colorectal carcinoma, and in six from other primary cancers. Chemotherapy alone had been tried unsuccessfully in 16 of the patients. In all but one patient the hepatic artery was exposed within the portal triad, doubly ligated, and divided between the gastroduodenal and cystic arteries. In one patient with gastronoma, only the left branch of the hepatic artery was ligated. Cholecystectomy was performed routinely where the gallbladder was present. In four patients, the inferior phrenic arteries were ligated also, and the falciform, round and triangular ligaments were divided. Postoperatively, oxygen was given by mask or nasal catheter to raise the O_2 pressure in the portal blood. Glucagon was given to three patients. Ligation was not performed in several cases when tumor growth was so extensive as to limit the quality and length of survival. In the 10 patients with colorectal carcinoma in whom ligation was performed, 5-fluorouracil therapy was begun immediately after recovery, by the systemic route in nine, and by catheter into the ligated distal hepatic artery in one patient. The six patients with metastases from other sources were given several different drugs. Sixteen patients survived surgery and were followed up for 19 months. Of the patients with colorectal carcinoma metastases, symptoms improved in four for 4, 4, 16, and 33 weeks. One patient, asymptomatic prior to surgery, remained so for 48 weeks postoperatively, and liver scans showed no changes during this time. In three of seven other patients liver scans showed improvement. Liver size decreased in four patients. Six patients died from 12-72 weeks after surgery. Three patients died from preventable complications, including cardiac arrhythmia, liver laceration during paracentesis, and renal failure. Of the six patients with metastases from other sources, symptoms improved in four patients for 16, 20, 40, and 43 weeks. Liver scans showed improvement in three from 20-43 weeks. Liver size decreased in one for 40 weeks. Four died 83, 40, 20, and 8 weeks after surgery. One had leiomyosarcoma and had initially refused chemotherapy. After 20 weeks of improvement, tumor growth resumed and was resistant to chemotherapy. One patient with melanoma did not respond to combination immunotherapy and chemotherapy, and died after 20 weeks. The overall mortality rate was 16%. Mortality was higher in patients with metastases comprising over 30% of liver volume. It is concluded that hepatic artery ligation and postoperative chemotherapy is effective in selected patients.

3376 CLINICAL ASSESSMENT OF LIVER SIZE IN NORMAL CHILDREN. *(E.)* Younoszai, M. K.; Mueller, S. (Coll. Med., Univ. Iowa, Iowa City). *Clin. Pediatr.* 14(4):378-387, 1975.

Clinical evaluation of liver size by percussion and palpation was tested in 105 children from 5 yr 4 months to 12 yr 3 months in age. The children were placed supine with knees flexed at maximum inspiration. The lower edge of the organ was determined by palpation in the mid-clavicular line, and the upper edge of liver dullness was determined by percussion. Both limits were marked by masking tape and the distance between them measured to the nearest mm and recorded as liver span. The distance between the lower edge of the liver and the costal margin in the right mid-clavicular line; and liver height in the mid-sternal line were measured by the same method. After measurements were made by one investigator, the markings were removed and meausrements were made by a second investigator. These were smaller by 0.4 cm in the boys and 0.2 cm in the girls than those of the first investigator. The correlation coefficient between corresponding measurements of the two investigators was statistically significant. When the liver span of each child was plotted against body weight and age, the slopes of the regression lines were significantly different than zero. The correlation coefficient between liver span and body height was statistically significant, increasing from 7 cm at 5 yr to 9 cm at 12 yr. Measurements of liver height in the mid-sternal region gave no consistent results. Measurements of the liver edge below the costal margin were variable. The maximal difference between investigators was 3.3 cm, while the maximal value was 8 cm. The correlation coefficient between the two sets of measurements was not statistically significant. It is concluded that liver span can be reliably measured in children, as in adults, by percussion and palpation.

3377 THE SELECTIVE INHIBITION OF CHENODEOXYCHOLATE SYNTHESIS BY CHOLATE METABOLITES IN MAN. *(E.)* Pomare, E. W.; Low-Beer, T. S. (Bristol R. Infirm., England). *Clin. Sci. Mol. Mrd.* 48(4): 315-321, 1975.

Pool size and rate of bile salt synthesis were studied in four volunteers by radioisotopic methods. Measured amounts of 24-^{14}C-cholate and chenodeoxycholate containing 3-4 μCi radioactivity each, were simultaneously injected i.v. after an overnight fast. Duodenal contents were aspirated after 3, 24, 48, 72 and 96 hr, and bile salt kinetics were calculated by the isotope dilution technique. Bile salts were separated by thin layer chromatography, chenodeoxycholate further separated from deoxycholate, and their specific radioactivities determined by liquid scintillation counter. Relative proportions of the three bile salts were measured by the 3α-hydroxysteroid dehydrogenase enzyme used to assay cholate, and the salicylaldehyde reaction used to assay deoxycholate. Several days after this first study, the subjects were given capsules containing 0.128 mM deoxycholate. Three subjects with chenodeoxycholate rates of 0.25-0.37 mM/day took the capsules twice daily with the meals, while the fourth (synthesis rate: 0.61 mM/day) took three capsules daily. A second study was begun 16, 29, and 32 days after starting the deoxycholate in the first three subjects (15 with gallstones, 13 cholecystectomized, eight with adult celiac disease, and 28 normal). Deoxycholate administration significantly expanded the deoxycholate pool. This was associated with a significant fall in pool size and synthesis rate of chenodeoxycholate with no change in its half-life, but there was no effect on any of these parameters of cholate. There was no consistent change in total bile salt pool, but total primary bile salt synthesis decreased in three of four subjects. There was an inverse relationship between the percentages of deoxycholate and chenodeoxycholate in all four subjects plus three from a previous study, and the 62 fasting subjects not given bile salts. It is concluded that deoxycholate regulates the size of the chenodeoxycholate pool independently of total bile salt pool size.

3378 SERUM α-FETOPROTEIN CHANGES AFTER PARTIAL HEPATECTOMY IN MAN. *(Ger.)* Lamerz, R.; Grunst, J.; Fateh-Moghadam, A.; Schmalhorst, U.; Pichlmaier, H.; Eisenburg, J. (1st Med. Clin., Univ. Munich, Germany). *Klin. Wochenschr.* 53(3):129-133, 1975.

α-Fetoprotein (AFP) was determined by radioimmunoassay on sera from four patients with serologically and histologically confirmed hydatid disease of the liver before and 1-63 days after surgery. Of these patients, two underwent resection of the left lobe; one of the entire right lobe; and one of half the right lobe. A patient who underwent thyroidectomy with the same type of anesthesia served as a control. Before surgery all patients had serum AFP concentrations in the normal range (below 20 ng/ml). However, 1-3 days after surgery AFP concentrations increased to a maximum of 2760 to 5600 ng/ml, i.e. 130-280 times the upper normal limit. Thereafter, the AFP concentration decreased, rapidly at first and then more slowly. In two cases normal values were found 35 and 53 days, resp., after surgery. The control had normal AFP concentrations both before and after surgery. Increases in serum AFP concentrations after partial hepatectomy are attributed to rapid liver cell regeneration.

3379 CYTOLOGICAL DIAGNOSIS OF HEPATIC METASTASES FROM A MALIGNANT MELANOMA ON A BIOPSY OBTAINED WITH AN ORDINARY NEEDLE. *(Ser.)* Djordjevic, M.; Stajic, M.; Begic-Janev, A.; Teodorovic, J.; Tomin, R. (Med. Fac., Univ. Belgrade, Yugoslavia). *Srp. Arh. Celok. Lek.* 102(3/4):269-274, 1974.

3380 KUPFFERIAN HEMANGIOENDOTHELIOSARCOMA OF THE LIVER (KUPFFER CELL SARCOMA): TWO CASES. *(Sp.)* Gentili, V.; Vales, O.; San Roman, A. (G. Rawson Hosp., Buenos Aires, Argentina). *Rev. Esp. Enferm. Apar. Dig.* 44(8):811-816, 1974.

3381 HEPATOSPLENIC SARCOIDOSIS ASSOCIATED WITH HEPATIC SCHISTOSOMIASIS. *(Fr.)* Dry, J.; Leynadier, F.; Huguier, M.; Pradalier, A.; Roger, M. (Rothschild Hosp., Paris, France). *Nouv. Presse Med.* 4(4):269-270, 1975.

3382 DNA SYNTHESIS IN HUMAN LIVER BIOPSIES. *(Ger.)* Safrany, L.; Tulassay, Z.; Kopper, L. (1st Med. Clin., Semmelweiss Univ., Budapest, Hungary). *Z. Gastroenterol.* 13(1):23-26, 1975.

3383 THE LIVER AND PREGNANCY. *(It.)* Carollo, F. (Inst. Clin. Obstet. Gynecol. I, Univ. Palermo, Italy). *Minerva Ginecol.* 26(9):542-556, 1974.

3384 EFFECT OF MASSIVE BLOOD TRANSFUSIONS ON LIVER FUNCTION AS RELATED TO BLOOD STORAGE TIME. *(Rus.)* Iakobson, M. M.; Kniazeva, G. D.; Guseinov, Ch. S.; Rakhmaeva, V. A. (A. V. Lunacharskii Med. Inst., Astrakhan, USSR). *Khirurgiia (Mosk.)* (3):74-79, 1973.

3385 ORAL CONTRACEPTIVES AND LIVER FUNCTION. *(It.)* Cittadini, E.; Catalano, G. (Inst. Clin. Obstet. Gynecol. I., Univ. Palermo, Italy). *Minerva Ginecol.* 26(9):533-541, 1974.

3386 SEX STEROIDS AND LIVER FUNCTION. *(It.)* Maneschi, M.; Martorana, A. (Inst. Clin. Obstet. Gynecol. II, Univ. Palermo, Italy). *Minerva Ginecol.* 26(9):526-532, 1974.

3387 CHANGES IN THE ACTIVITY OF TESTOSTERONE-ACTIVATING ENZYMES IN HUMAN HEPATIC TISSUE IN CHOLESTASIS AND CIRRHOSIS. *(Ger.)* Littman, K. P.; Winter, G.; Gerdes, H. (Med. Clin., Univ. Marburg, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:1258-1261, 1973.

3388 DIAGNOSING THE CAUSE OF HEPATOCELLULAR AND OBSTRUCTIVE JAUNDICE: REVIEW OF 100 CASES. *(Sp.)* Liso, P.; Alves, J.; Santolaria, F.; Huguet, R.; Cabarcos, A.; Bruguera, J. A.; Conchillo, F. (Fac. Med., Navarra Univ., Pamplona, Spain). *Rev. Esp. Enferm. Apar. Dig.* 44(8):753-766, 1974.

3389 BIOCHEMICAL AND CLINICAL ASPECTS OF WILSON'S DISEASE. *(Pol.)* Drozdz, M.; Kucharz, E.; Kozolowski, A. (Silesian Acad. Med., Katowice, Poland). *Przegl. Lek.* 31(9):310-314, 1974.

3390 GLYCOGEN STORAGE DISEASES. *(Fr.)* Pignon, G. (no affil.). *Rev. Fr. Gastroenterol.* (99):17-20, 23-25, 26, 30, 1974.

3391 TRAUMATIC RUPTURE OF THE LIVER. THE PLACE OF SUBSEQUENT HEPATECTOMY. *(Fr.)* Ribet, M.; Leplat, F.; Faillon, J. M.: Mulliez, P.; Wurtz, A.; Henriet, P. (Univ. Hosp. Cent., Lille, France). *Lille Chir.* 29(2):59-65, 1974.

3392 NOMOGRAM FOR ESTIMATING NORMAL LIVER WEIGHTS. *(E.)* Eldridge, J. E.; Capurro, P. U. (Union Hosp. Cecil Cty., Elkton, Md.). *J. Nucl. Med.* 16(4):314, 1975.

3393 TRADITION AND INNOVATION: REFLECTIONS ON SELECTED HISTORICAL HIGHLIGHTS IN THE FIELD OF HEPATIC SURGERY. *(E.)* Gans, H. (New York Hosp.-Cornell Univ. Med. Cent., N.Y.). *Surgery* 77(4):593-601, 1975.

3394 SEVENTEEN CASES OF HEPATECTOMY. *(E.)* Lannon, J. (Johannesburg Gen. Hosp., South Africa). *S. Afr. J. Surg.* 12(4):227-232, 1974.

3395 THE IMMUNOLOGIC BASIS OF LIVER DISEASE. *(E.)* Popper, H. (Mt. Sinai Sch. Med., City Univ. New York, N.Y.). *Bull. NY Acad. Med.* 51(4): 519-527, 1975.

3396 SIMULTANEOUS MEASUREMENT OF BROMSULPHALEIN [SIC!] INITIAL DISTRIBUTION VOLUME AND ^{131}I-ALBUMIN PLASMA VOLUME IN PATIENTS WITH LIVER DISEASE. A STUDY OF 195 PATIENTS AND A REVIEW OF THE LITERATURE. *(E.)* den Blaauwen, D. H.; Thijs, L. G.; Roos, P. (Free Univ. Hosp., Amsterdam, Netherlands). *Gastroenterol. Belg.* 37(7/8):313-338, 1974.

3397 THE ANTERIOR APPROACH TO PERCUTANEOUS LIVER BIOPSY. *(E.)* Kondi, E. S.; Gallitano, A. L. (Boston, Univ. Med. Cent., Mass.). *Surg. Gynecol. Obstet.* 140(3):423-424, 1975.

3398 THE GLYCOSAMINOGLYCANS IN HUMAN HEPATIC CANCER. *(E.)* Kojima, J.; Nakamura, N.; Kanatani, M.; Ohmori, K. (Cent. Adult Dis., Osaka, Japan). *Cancer Res.* 35(3):542-547, 1975.

3399 ULTRASOUND MONITORING OF HEPATIC METASTASES DURING CHEMOTHERAPY. *(E.)* Gilby, E. D.; Taylor, K. J. W. (Inst. Cancer Res., Sutton, England). *Br. Med. J.* 1(5954):371-373, 1975.

3400 PRIMARY HEPATIC CANCER IN INFANCY AND CHILDHOOD. A SURVEY OF TWENTY CASES. *(E.)* Sinniah, D.; Campbell, P. E.; Colebatch, J. H. (R. Child. Hosp., Parkville, Australia). *Prog. Pediatr. Surg.* 7:141-170, 1974.

3401 EXTENSIVE CALCIFICATION IN THE STROMA OF A PRIMARY HEPATIC CARCINOMA. *(E.)* Moenandar, I. M. (Dep. Pathol., Univ. Leiden, Netherlands). *J. Pathol.* 114(1):53-54, 1974.

3402 HEPATIC ANGIOSARCOMA. *(E.)* McAllister, Jr., H. A.; Ishak, K. G. (Armed Forces Inst. Pathol., Washington, D.C.). *Am. J. Clin. Pathol.* 63(4):601, 1975.

3403 TRAUMATIC INTRAHEPATIC HEMATOMA. REPORT OF A CASE. *(E.)* Solheim, K.; Bugge-Asperheim, B. (Ulleval Hosp., Oslo, Norway). *Acta Chir. Scand.* 140(8):667-669, 1974.

3404 REYE'S SYNDROME IN MICHIGAN: THE 1974 EPIDEMIOLOGIC EXPERIENCE. *(E.)* Thompson, T. R.; Gordon, R. C.; Baublis, J. V. (Michigan Dep. Public Health, East Lansing). *Mich. Med.* 74(6):69-73, 1975.

3405 JAUNDICE FOLLOWING BURNS. *(Ger.)* Chlumsky, J.; Vrabec, R.; Chlumska, A. (Fac. Med. Hyg., Charles Univ., Prague, Czechoslovakia). *Dtsch. Z. Verdau. Stoffwechselkr.* 34(2-4):237-239, 1974.

3406 INTRAHEPATIC CHOLEDOCHAL CYST. *(E.)* Rangabashyam, N.; Krishnaraj, B.; Mohan, C.; Ramakrishnan, V. (Stanley Med. Coll., Madras, India). *Am. J. Gastroenterol.* 63(1):71-74, 1975.

3407 FIBRINOID NECROSIS OF LIVER PARENCHYMAL CELLS. *(E.)* Sumegi, I. (Karolinska Hosp., Stockholm, Sweden). *Acta Pathol. Microbiol. Scand. [A]* 83(1):109-119, 1975.

3408 CAN COLONIC BACTERIAL METABOLITES PREDISPOSE TO CHOLESTEROL GALL STONES? *(E.)* Low-Beer, T. S.; Pomare, E. W. (Bristol R. Infirm., England). *Br. Med. J.* 1(5955):438-440, 1975.

3409 ENCEPHALOPATHY AND FATTY DEGENERATION OF THE VISCERA (EFDV): BIOCHEMICAL CHARACTERIZATION. *(E.)* Alvira, M. M.; Forman, D. T. (Evanston Hosp., Ill.). *Am. J. Clin. Pathol.* 63(4):600, 1975.

3410 HYDATID DISEASE IN CHILDREN. *(E.)* Auldist, A. W.; Myers, N. A. (R. Child. Hosp., Melbourne, Australia). *Aust. NZ J. Surg.* 44(4):402-407, 1974.

3411 UNUSUAL PRESENTATION OF A HEPATIC HYDATID CYST. *(E.)* Bose, S. M.; Monga, N. K. (Inst. Med. Educ. Res., Chandigarh, India). *Aust. NZ J. Surg.* 44(4):407-409, 1974.

See also, 2418, 2629, 2874, 2875, 2892, 2914, 2919, 2920, 2921, 2922, 2924, 2925, 2928, 2929, 2936, 2937, 2938, 2939, 2947, 2953, 2955, 2963, 3017, 3032, 3305, 3336, 3412, 3419, 3441, 3520, 3523, 3533, 3538, 3539, 3544, 3567, 3607, 3690, 3744, 3746, 3752, 3772.

LIVER AND BILIARY TRACT

Hyperbilirubinemic States

3412 MANAGEMENT OF YOUNG INFANTS PRESENTING WITH DIRECT-REACTING HYPERBILIRUBINEMIA. *(E.)* Sass Kortsak, A. (Dep. Pediatr., Univ. Toronto, Canada). *Pediatr. Clin. North Am.* 21(4):777-799, 1974.

Early detection followed by immediate and intensive investigation is essential for the survival of young infants with direct-reacting hyperbilirubinemia, with an aim toward a specific diagnosis of the underlying disease. Failure to arrive at a diagnosis results in having to distinguish between extrahepatic biliary atresia and other extrahepatic bile duct anomalies which are potentially correctable by surgery on the one hand, and intrahepatic disease leading to cholestasis (neonatal hepatitis syndrome) on the other. The degree of biliary obstruction must be determined and, if complete obstruction is found, whether it is sustained with the passage of time. Serum 5'-nucleotidase and bile acid studies are helpful at this point in the diagnosis. Liver function tests and needle biopsy of the liver also help. Patients with strong suspicion of extrahepatic biliary atresia should undergo surgical exploration between 2-3 months of age or earlier, but not before all avenues of investigation that may lead to another specific diagnosis or may exclude the diagnosis of biliary atresia are exhausted. Patients with long-standing severe cholestasis require dietary management and fat-soluble vitamin supplementation in excess of the normal requirements for maintenance. Patients with long-standing intrahepatic cholestasis may benefit from cholestyramine and/or phenobarbital.

3413 UNCONJUGATED HYPERBILIRUBINEMIA: PHYSIOLOGIC EVALUATION AND EXPERIMENTAL APPROACHES TO THERAPY.

(E.) Berk, P. D.; Martin, J. F.; Blaschke, T. F.; Scharschmidt, B. F.; Plotz, P. H. (Natl. Inst. Arthritis Metab. Dig. Dis. Bethesda, Md.). *Ann. Intern. Med.* 82(4):552-570, 1975.

A physiologic approach to the evaluation of patients with unconjugated hyperbilirubinemia was described, along with a case study of a patient with Crigler-Najjar syndrome and a review of established and experimental methods used to reduce the plasma unconjugated bilirubin concentration. Kinetic studies with radiolabeled bilirubin provided for measurement of the rate at which newly synthesized bilirubin entered the plasma and the rate of hepatic bilirubin removal. Quantitation of both of those variables permitted a precise classification of patients with unconjugated hyperbilirubinemia into those with increased bilirubin production, those with decreased hepatic bilirubin clearance (Gilbert's syndrome), and those in which both factors played a role. A rare case of Crigler-Najjar syndrome was described in which bilirubin encephalopathy developed at 18 yr. Various procedures were used in an attempt to reduce the patient's plasma bilirubin concentration by either increasing bilirubin clearance or reducing bilirubin turnover: drug therapy, phototherapy, and phlebotomy. None of those methods were effective in relieving the patient's jaundice but led to further investigations into specific methods of removing bilirubin from the blood. Hemoperfusion experiments in animals gave results that appeared potentially useful for clinical problems. The studies offered new information about the metabolism of bilirubin in type-1 congenital nonhemolytic jaundice, and suggest that the alternate metabolic pathways by which bilirubin is excreted in this syndrome are in some way dependent on the rate of bilirubin production.

3414 INHERITANCE OF THE DUBIN-JOHNSON-SPRINZ SYNDROME.

(E.) Edwards, R. H. (Armed Forces Inst. Pathol., Washington, D.C.). *Gastroenterology* 68(4):734-749, 1975.

To establish the mode of inheritance of the Dubin-Johnson-Sprinz (DJS) syndrome, propositi were ascertained through liver biopsies of jaundiced patients, pedigree information on propositus families obtained through questionnaires, and the presence or absence of the syndrome in relatives determined by liver function tests Conjugated hyperbilirubinemia and elevated BSP levels (higher at 120 min than at 45 min), characteristic of the DJS syndrome, were observed in 17 of 44 tested siblings of 44 DJS patients. Results of these liver function tests on all of 20 parents and 64 children of propositi indicated that they were not affected. Parents of 11 of 39 DJS patients were reportedly consanguineous. The high frequency of parental consanguinity, the incidence of the syndrome among siblings of patients, the lack of involvement of more than 1 generation within each family, and consideration of other reports of familial DJS syndrome suggest the syndrome is inherited only as an autosomal recessive trait. Reports of cases inherited as a dominant trait are probably due to erroneous diagnosis of propositi or their relatives or to pseudodominant inheritance of the recessive trait. Appreciation of this mode of inheritance may be helpful in the differential diagnosis of the constitutional hyperbilirubinemias and in the elucidation of the nature of the hepatic excretory defect in the DJS syndrome and other constitutional hyperbilirubinemias (Gilbert's and Rotor's syndromes).

3415 LIVER ULTRASTRUCTURE IN GILBERT'S SYNDROME.

(E.) McGee, J. O'D; Allan, J. G.; Russell, R. I.; Patrick, R. S. (R. Infirm., Glasgow, Scotland). *Gut* 16(3):220-224, 1975.

Nine young patients with Gilbert's syndrome were studied, 4 of whom had no symptoms in association with the episodes of jaundice, 3 who complained of nausea, tiredness, and headache, and 2 who had abdominal discomfort. Light microscopy of all liver specimens revealed no abnormality. No hemosiderin or visible bile pigment was observed. Lipochrome pigment in centrilobular zones was rarely prominent and was only sometimes seen in liver biopsies from patients with no disorder of bilirubin metabolism. Similarly the electron microscopic examination showed no abnormalities. Pigmented bodies were not observed in excessive numbers and there were none of the degenerative features in plasma membranes, mitochondria, or sinusoidal cells described by other reports. The rough endoplasmic reticulum was not damaged although the amount was apparently reduced in some hepatocytes. In every case agranular endoplasmic reticulum was very prominent and fairly uniform between the individual parenchymal cells. In only 1 case was there any conspicuous dilatation of these vesicular structures, probably due to some delay in fixing the tissues for electron microscopy. There was a 3- to 9-fold increase in agranular endoplasmic reticulum in these cases. This excess agranular endoplasmic reticulum was the only consistent and notable feature of hepatocyte ultrastructure. None of these 9 patients was alcoholic or had been addicted to phenobarbital or other drugs known to cause hypertrophy of agranular endoplasmic reticulum. It is suggested that this ultrastructural feature may be part of Gilbert's syndrome and could have some diagnostic significance in the investigation of doubtful cases of unconjugated hyperbilirubinemia.

3416 THE METABOLISM OF SULFOBROMOPHTHALEIN (BSP) IN DUBIN-JOHNSON DISEASE. *(Sp.)* Gibert-Queralto, J.; Rodes, J.; de Zubizarreta, A.; Bruguera, M. (Fac. Med., Barcelona, Spain). *Fegato* 19(2):481-497, 1973.

Plasma clearance curves for BSP were studied in four patients with Dubin-Johnson syndrome. Each patient received 5 mg/kg of BSP i.v., and BSP concentrations were measured in blood samples taken 8-150 min after injection of the dye. These plasma clearance curves for BSP were very similar in all four patients: a rapid decrease occurred until 30-45 min after injection, after which total plasma BSP concentrations continued to increase slowly until 120-150 min after injection. At 45 min, BSP retention was increased in three patients and normal in one. The percentage of BSP which returned to the circulation between 45 and 120 min after injection ranged from 10.35% to 12.39% in three cases, i.e. total plasma BSP concentrations were increased to almost the same extent. These findings demonstrate that uptake of BSP by the liver is normal in Dubin-Johnson syndrome, but once the point of saturation is reached, serum BSP levels decrease more slowly in patients with Dubin-Johnson syndrome than in normal subjects. It is suggested that these abnormalities are due to impaired excretion of conjugated BSP from the liver into the biliary tract. This was confirmed by measuring free and conjugated BSP fractions in the serum by thin-layer chromatography on silica gel G and elution with a mixture of *n*-butanol, acetic acid, and water (4:1:6) for 24 hr. Plasma clearance curves for BSP obtained from these patients differed from those in extrahepatic obstructive jaundice and hepatic amyloidosis. In the latter two diseases, the increases in plasma BSP concentrations occurred later (75 min after injection) and more slowly than those in Dubin-Johnson syndrome. BSP retention at 45 min was pronounced in extrahepatic obstructive jaundice but not in Dubin-Johnson syndrome or hepatic amyloidosis. It is suggested that plasma clearance curves for BSP might prove useful in the diagnosis of Dubin-Johnson syndrome, providing that hepatic biopsies were taken for confirmation.

3417 COMPARISON OF TREATMENTS FOR CONGENITAL NONOBSTRUCTIVE NONHAEMOLYTIC HYPERBILIRUBINAEMIA. *(E.)* Arrowsmith, W. A.; Payne, R. B.; Littlewood, J. M. (Seacroft Hosp., Leeds, England). *Arch. Dis. Child.* 50(3):197-201, 1975.

Alternatives to phototherapy for treatment of Arias type 1 Crigler-Najjar syndrome were investigated. A 2-yr-old female developed jaundice at 16 hr of age. Total serum bilirubin was 12.4 mg/100 ml, of which 0.6 was conjugated. Phototherapy treatment was begun and continued for 2 yr. During that time, bilirubin levels ranged from 10-28 mg/100 ml, but mental and physical development remained normal. To eliminate the need for 20 hr phototherapy daily, and allow more normal future development, less restrictive methods of therapy were investigated including potassium aspartate (300 mg twice daily), high fat diet (66.9 g fat/day), phenobarbitone (15 mg/day), uridine diphospho(UDP)-glucose (20 mg twice daily), cholestyramine (2 g twice daily), and agar (1g/kg/day). Each treatment was given for three weeks with three week intervals between treatments. Because of variability during the control period of bilirubin concentration (12-20 ng/100 ml) a statistical method to calculate linear regression for bilirubin concentration on time and its correlation coefficient during each treatment and its control period was developed. The probability that there was a significant linear regression with time, and that the regression was significantly different from the change of bilirubin with time in the control period, was calculated. There was a statistically significant fall with time in serum bilirubin concentration during the treatments with aspartic acid, high fat diet, and cholestyramine. During the high fat diet there was an absolute fall of about 4 mg/100 ml with no gradual progressive change. During cholestyramine treatment there was a highly significant rise in the following control period. The significance of the aspartic acid treatment rested on one pair of values. Continuous cholestyramine therapy was started, and bilirubin values were significantly lower (12.3) after 4 months than in the 8 week control period (15.5) despite reduction in phototherapy time. Present levels range from 9.0-14.0 mg/100 ml. It is concluded that cholestyramine is an effective supplement to phototherapy in the treatment of hyperbilirubinemia.

3418 CONSIDERATIONS OF THE PATHOGENESIS OF NEONATAL HEPATITIS, BILIARY ATRESIA AND CHOLEDOCHAL CYST - THE CONCEPT OF INFANTILE OBSTRUCTIVE CHOLANGIOPATHY. *(E.)* Landing, B. H. (Child. Hosp. Los Angeles, Calif.). *Prog. Pediatr. Surg.* 6:113-139, 1974.

3419 JAUNDICE DUE TO NICOTINIC ACID THERAPY. *(E.)* Einstein, N.; Baker, A.; Galper, J.; Wolfe, H. (Tufts-New Engl. Med. Cent., Boston, Mass.). *Am. J. Dig. Dis.* 20(3):282-286, 1975.

See also, 2595, 2605, 2926, 2927.

3420 HALOTHANE HEPATITIS — A REPORT OF FIVE CASES.

(E.) Paull, A.; Grant, A. K. (Queen Elizabeth Hosp., Woodville, Australia). *Med. J. Aust.* 1(24):954-957, 1974.

Five cases of acute hepatocellular injury following halothane anesthesia are reported. A 63-yr-old man underwent abdominoperineal resection of the rectum for rectal carcinoma under anesthesia which included halothane. After 21 days cystoscopy was performed, under halothane anesthesia. Five days later a transurethral resection of a hypertrophied prostate was performed, again using halothane. A 60-yr-old woman underwent dilatation and curettage for postmenopausal uterine bleeding under halothane anesthesia. Under halothane anesthesia, an intrauterine radioactive source was inserted 13 days later. Five weeks later, again using halothane, abdominal hysterectomy was performed. A 21-yr-old woman was treated for a vulval abscess, under halothane anesthesia. Six weeks later dental extraction was performed again using halothane. A 55-yr-old man, victim of a boating accident, required four operations during the course of one month and halothane was used as an anesthetic agent on all but the first occasion. A 36-yr-old man had a meniscectomy under halothane anesthesia. About 7 weeks later, hemorrhoidectomy was performed, again using halothane. Each of these patients developed hepatocellular jaundice within 5-12 days after the last exposure to halothane. Liver function tests showed: serum bilirubin 5.9-34 mg/100 ml; SGOT, 100-2800 Karmen U; and alkaline phosphatase, 20-35 King-Armstrong U. No patient had exposure to viral hepatitis nor had any received other known hepatotoxic drugs. In the second case the prothrombin time fell markedly in spite of intramuscular vitamin K therapy and the patient died. In the fourth case, the prothrombin time also fell markedly, but improved after i.m. injections of vitamin K_1. Liver biopsy was performed on every patient and showed changes varying from moderately severe hepatitis to submassive necrosis in the patient who died. It is felt that the incidence of halothane hepatitis can be reduced. It is suggested that halothane not be administered to patients who require several operations within a short period of time, or to those who develop unexplained fever, bilirubinuria, abnormal results on liver function tests or jaundice after its use.

3421 LIVER GRANULOMAS CONTAINING COPPER IN VINEYARD SPRAYER'S LUNG. A NEW ETIOLOGY OF HEPATIC GRANULOMATOSIS.

(E.) Pimentel, J. C.; Menezes, A. P. (Dep. Pathol., D. Carlos I Sanit., Lisbon, Portugal). *Am. Rev. Resp. Dis.* 111(2):189-195, 1975.

Three cases of a new type of hepatic granulomatosis which may occur in rural workers who spray vineyards with a solution of copper sulfate neutralized with hydrated lime (Bordeaux Mixture) for the prevention of mildew are presented. The cases reported occurred in 3 male rural workers, aged 52-59 yr. In each case the patients' symptoms seem to have been triggered or aggravated by intercurrent infections. The patients were exposed to Bordeaux Mixture from 3-15 yr. Diagnoses were confirmed at autopsy and by lung biopsy and were based on an occupational history and on the finding of granulomas and fibro-hyaline nodular scars containing inclusions of copper. In each case hepatic changes were found by histology which consisted of proliferation and diffuse swelling of Kupffer cells, sometimes showing a tendency to gather in clusters, and the formation of well-defined histiocytic or sarcoid-type granulomas. These lesions were always found near the portal tracts. In the one case where micronodular cirrhosis co-existed, the granulomas were found in the fibrous strands that limited the nodules of regenerated hepatic tissue. Liver lesions were not accompanied by significant clinical or biochemical abnormalities. Micronodular cirrhosis and fatty liver, present in one patient each, were probably related to alcohol intake and not to vineyard sprayer's disease. The granulomas described in the liver of vineyard sprayers are a new type of hepatic granulomatosis which can occur in patients with a pulmonary disease of inhalatory origin. The identification of copper within the lesions, revealed by histochemical techniques, characterizes the nature of these granulomas. The cases presented here suggest that in all patients in whom pulmonary and hepatic granulomas of unknown cause co-exist, or in whom the diagnosis of sarcoidosis is made by exclusion, the possibility of the existence of a disease caused by the inhalation of pathogenic dusts must be considered. A possible aggressive substance within the lesions must be sought, using the appropriate histochemical techniques.

3422 LIVER PATHOLOGY IN CHRONIC BRUCELLOSIS.

(E.) Boron, P.; Jezyna, C.; Korenkieciwz, I.; Musiatowicz, B. (Bialystok Med. Sch., Poland). *Acta Hepatogastroenterol. (Stuttg.)* 21(4):261-266, 1974.

Functional and morphological estimation of liver pathology was studied in 116 patients (28 women and 88 men, aged 20-68 yr) with chronic brucellosis. The patients were agricultural and veterinary workers with professional exposure from 1-20 yr, in the majority of cases, from 6-14 yr. Examinations showed that in 32% of the cases liver disorders were observed, while hepatomegaly was found in 88%. Mild hyperbilirubinemia (up to 3 mg%) was noted in 20% of the subjects. Elevated SGPT values were observed in about 18% of the patients. Positive sulfobromophthalein tests were noted in 28.5% of those examined. Hypoproteinemia below 6 g% was noted in 12% and hyperproteinemia in 27.2% of the patients. Hypergammaglobulinemia characteristic for observed liver changes was observed in 60%, hypoalbuminemia in 70%, and hyper-α_2-globulinemia in 72%. Only 8 cases (6.9%) of the 116 patients showed inflammatory infiltrations of a focal nature. In the remaining patients, liver changes histologically distinct did not show specificity for brucellosis. Bile stasis was noted in only six cases. Small symptoms of hepatic fibrosis were noted in five cases. In only one patient did the liver biopsy fail to reveal any pathological changes. In the majority of patients the changes were characteristic of hepatitis *reactiva non specifica*. The content of glycogen in liver cells in clinically active chronic brucellosis was distinctly lower than in cases of clinically nonactive chronic brucellosis and in metabrucellosis. No statistically significant correlation was found between the increasing morphological changes of liver biopsy and the behavior of particular immunoserological reactions. These results indicate that liver pathology in the course of chronic brucellosis has the symptoms of morphological changes and functional disorders. Functional disorders observed on the basis of laboratory parameters rather than on the basis of clinical pictures do not show significant correlation to changes of granulomatous type hepatitis. They are correlated, rather, to the changes of non-specific reaction of liver inflammation.

3423 COAGULATION STUDIES AS A PROGNOSTIC INDEX IN ACUTE LIVER FAILURE.

(E.) Dymock, I. W.; Tucker, J. S.; Woolf, I. L.; Poller, L.; Thomson, J. M. (Withington Hosp., Manchester, England). *Br. J. Haematol.* 29(3):385-396, 1975.

A series of coagulation tests was employed to determine the relative importance of the various mechanisms for the production of the coagulation defect in 12 patients (11 women and one man, aged 8-71 yr) with acute liver failure. Clinical diagnoses in these patients included viral hepatitis (six), paracetamol poisoning (three); and halothane toxicity (three). All four patients who presented in Grade IV coma died, as did one of the seven Grade II patients and the one Grade III patient. All who died had clinical evidence of bleeding, usually from the alimentary canal. None of the survivors bled. Excessively prolonged prothrombin time ratios were encountered in all patients who died. The three with the least disturbance of prothrombin ratio recovered. The other seven formed an intermediate group with ratios between 3.0 and 4.8, three of whom recovered, and four died. Results of the cephalin time were substantially similar to those of the prothrombin time test with no clear indication of chances of recovery. In both these tests there was a lack of correlation with fibrinogen degradation product titers (FDP). In no patient was the euglobulin lysis time less than 1 hr. Fibrinolysis was not likely the cause of raised FDP titers present in seven patients. Fibrinogen levels show no correlation with elevation of FDP. A reasonable agreement is noted between factor-VII levels and clot opacity. The speed of thrombin/fibrinogen reaction did not correlate well with lowered levels; there is no consistent relation to the chances of survival or to the degree of coma. Factor-VII determinations were performed in 11 of the patients and appeared to be quantitatively related to the chances of survival. Six with a factor-VII level of 9% or above survived, whereas five with a level of 8% or below died. There was not, however, a close relation between factor-VII levels and the grade of coma. Indeed the grade of coma did not appear as good a guide to the chances of survival as did the factor-VII assay. No apparent relation was noted between the FDP level and survival. There was no correlation between the platelet count and the elevation of FDP titer. In conclusion, this study emphasizes the importance of the synthetic ability of the liver in determining the prognosis in acute liver failure. The ability of the factor-VII assay to assess survival chances in individual patients suggests that the assay is a reasonably accurate guide

3424 HISTOMORPHOLOGY OF THE LIVER IN DAMAGE PRODUCED BY PHENOLISATIN-CONTAINING LAXATIVES (RECURRENT CHRONIC CHOLANGITIS AND HEPATITIS).

(Ger.) Luders, C. J.; Riske, W. E. O.; Henning, H.; Vogel, H. M. (Wenckebach Hosp., Berlin, Germany). *Virchows Arch.* [*Pathol. Anat.*] 365(4):309-325, 1975.

Semiquantitative histological studies were made of needle biopsies of the liver, obtained at laparoscopy, from 36 women with histories of laxative ingestion. Laxatives containing triacetyl- or diacetylphenolisatin (10-30 mg) were given to these patients 12-24 hr (16 cases), 48 hr (eight cases), 72-96 hr (four cases), or 7-14 days (four cases) before biopsies were taken; two patients received 2 doses each of these laxatives. Before finding out about laxative ingestion, 31 of these patients had the following histological diagnoses: chronic aggressive hepatitis (13 cases), combination of chronic aggressive hepatitis and chronic, nonsuppurating, destructive cholangitis (three cases); inactive chronic hepatitis (eight cases); fibrosis resulting from chronic hepatitis (two cases); and inactive cirrhosis (five cases). Acute phenolisatin-induced liver injury should be considered if biopsies show a combination of chronic aggressive hepatitis with acute cholangiolitis, portal edema, and eosinophilic infiltration. Portal bile ductules show proliferation, infiltration, and destructive changes. The absence of introcanalicular cholestasis rules out a diagnosis of mechanical obstruction of the biliary tract. Signs of inactive chronic hepatitis with portal and septal fibrosis and lymphocytic infiltrates in the portal area are suggestive of phenolisatin-induced damage if neutrophilic or eosinophilic granulocytes are found on closer inspection. The presence of larger numbers of proliferating bile ductules provides further evidence on which to base the diagnosis. Within 3-4 days after laxative ingestion, signs of acute cholangitis begin to regress, but chronic hepatitis is still evident after 7-14 days. The unexpected improvement or recovery of patients with histologically confirmed chronic aggressive hepatitis, primary biliary cirrhosis, or a combination of these two conditions is highly suggestive of drug-induced liver damage, particularly of phenolisatin-induced damage.

3425 CHOLESTATIC HEPATITIS AS AN UNUSUAL ALLERGIC REACTION TO CEPHALOTHIN THERAPY.

(Ger.)

Schaefer, U. W.; Hackenberg, K.; Reinwein, D. (Clin., Univ. Essen, Germany). *Munch. Med. Wochenschr.* 117(7):251-252, 1975.

A 29-yr-old man with a history of recurrent infection, probably caused by *Streptococcus*, had repeatedly developed allergic reactions to various penicillins. These allergies were marked by exanthemas, swellings of the joints, and enlargements of the lymph nodes. Cephalothin (8 g/day in i.v. infusions) was administered for 18 days. However, after 7 days, increases occurred in direct serum bilirubin, SGOT, SGPT, alkaline phosphatase, leucine aminopeptidase, and lactate dehydrogenase levels. Hepatitis-associated antigen was detected by the complement-fixation test in a titer of 1:16. Urinary bilirubin and urobilinogen concentrations increased, and the patient developed jaundice, mild hepatomegaly, and bilateral pleural effusions. After 17-18 days of cephalothin therapy, the patient's temperature suddenly increased to 39.6 C and the percentage of eosinophils increased to 11%. After discontinuation of cephalothin, the temperature decreased and all of the other pathological findings disappeared, suggesting that this was an allergy. Since the skin was not involved and hepatic symptoms were the most evident, the symptoms observed differ from those classically found in a drug allergy. Because cephalothin is not hepatotoxic, the cholestatic hepatitis is considered to be an immunological hypersensitivity reaction.

3426 THE HEPATOTOXICITY OF LAXITIVES: ADDITIONAL RESULTS ABOUT INGESTION OF PHENOLISATINS AND BISACODYL. *(Ger.)* Henning, H.; Vogel, H. M.; von Braun, H. H. (Fohrenkamp Clin., Fed. Inst. Employee Insur., Molln (Lauenburg), Germany). *Z. Gastroenterol.* 12(1):15-18, 1974.

Diacetyldiphenolisatin (10-30 mg), triacetyldiphenolisatin (10-30 mg), or bisacodyl (20 mg) was given to 460 patients, all but 45 of whom had chronic liver disease. Two doses were given to 24 of these patients. Acute exacerbations of the liver disease occurred in 24 cases, and no changes in serum enzyme activities were observed in 436. Chronic aggressive hepatitis was present in 14 of the 24 patients who developed phenolisatin-induced exacerbations. The remaining 10 patients had cirrhosis (three cases); chronic persistent hepatitis with and without cholestasis (four cases); chronic hepatitis with and without suspected aggression (two cases); and hepatic scarring with cirrhosis and ascites (one case). Bisacodyl did not cause any exacerbations of liver disease in the 200 patients to whom it was given. These findings suggest that phenolisatin-containing laxatives are responsible for almost 10% of the chronic liver disease in this group of patients. It is recommended that these laxatives be taken off the market in Germany.

3427 CONTROLLED TRIAL OF REPEATED HALOTHANE ANAESTHETICS IN PATIENTS WITH CARCINOMA OF THE UTERINE CERVIX TREATED WITH RADIUM. *(E.)* Trowell, J.; Peto, R.; Smith, A. C. (Radcliffe Infirm., Oxford, England). *Lancet* 1(7911):821-824, 1975.

The role of halothane in the etiology of liver damage was investigated in 39 women undergoing radium therapy for cervical carcinoma. Patients were randomized either to a halothane group exposed to halothane at each anesthetic (18 patients), or to a control group exposed to various other anesthetics using special halothane-free equipment (21). SGPT was measured in each patient the day before each anesthetic. Four patients in the halothane group developed SGPT levels over 100 IU/liter on admission for the third radium treatment (106-1350 IU/liter). Three had already had three previous exposures to halothane. None of the controls developed SGPT levels over 100 IU/liter, and no other function abnormalities were found in either group. It is concluded that liver damage is more common in cervical carcinoma patients after repeated halothane anesthetics than after other various common anesthetics.

3428 CONTROLLED PROSPECTIVE STUDY OF THE EFFECT ON LIVER FUNCTION OF MULTIPLE EXPOSURES TO HALOTHANE. *(E.)* Wright, R.; Chisholm, M.; Lloyd, B.; Edwards, J. C.; Eade, O. E.; Hawksley, M.; Moles, T. M.; Gardner, M. J. (Southamptom Univ. Hosp., England). *Lancet* 1(7911):817-821, 1975.

Liver function in patients repeatedly exposed to halothane was compared with that of controls given other anesthetics. Patients who had been given at least one anesthetic containing halothane within one yr, and presented again for anesthesia were randomly divided into two groups, one to be given halothane, and the other to be given any other anesthetic from halothane free equipment, except methoxyflurane. Premedication was with opiate and an antisialogogue; induction was with sodium thiopentone or alphadolone/alphaxalone and maintenance was with nitrous oxide and oxygen. Patients presenting for anesthesia more than once were elgible for reentry at random. Venous blood was taken immediately before and immediately after administration of anesthetic, and subsequently every 3-5 days for at least 2 weeks. Liver function tests included SGOT, SGPT, lactic dehydrogenase, total protein, albumin, and alkaline phosphatase. In the 160 patients studied, halothane (80 patients) and control groups (80 patients) were comparable regarding clinical features, blood transfusion history, and drug administration. Four in each group had raised preoperative transaminase levels and were excluded from further study. Two of these (both controls) had had repeated halothane anesthetics during the 40 days before the experiment. Of the remaining 76 halothane patients, 15 had abnormally high transaminase levels during the follow-up, compared with four of the 76 controls. Fourteen of the 15 halothane patients, and three of the four controls had less than four previous anesthetics. Raised SGOT levels were also most common in the halothane group that had had less than four previous anesthetics.

In these patients the time between the anesthetics was considerably shorter than in those who had had more than four previously. Six halothane patients had an SGOT peak over twice normal level; this occurred transiently during the second week. One patient had an SGOT level of 440 U and liver biopsy showed necrosis typical of hepatitis. No other biopsies were done. Of 43 halothane patients who had less than four previous anesthetics, 18 had increased SGPT levels compared to five of 28 controls. It is concluded that repeated halothane exposure may significantly raise SGOT levels, possibly because of hepatocytic necrosis.

3429 HEPATOTOXICITY IN PSORIATICS TREATED WITH LARGE DOSES OF METHOTREXATE. *(E.)* Tindall, J. P.; Krueger, R. T.; Callaway, J. L.; Murrell, Jr., T. W. (Duke Univ. Med. Cent., Durham, N.C.). *Cutis* 15(4):512-517, 1975.

Psoriasis patients (27) who had received a total dosage of over 5 g methotrexate were studied to determine hepatotoxicity. Percutaneous biopsy specimens were taken from the liver, stained with hematoxylin and eosin or Masson-trichome, and divided into four grades: 1)mild or no fatty infiltration, nuclear variability, and portal inflammation; 2)moderate to severe degrees of these same three conditions; 3) fibrosis with septum formation; and 4)cirrhosis. BSP was drawn 45 min after injection of a weight related amount. Folate determinations were made on serum separated immediately after blood drawing. Methotrexate was discontinued for at least three weeks prior to evaluation. Of 15 patients with between 5 and 8 g total dosage, eight had mild or no abnormalities, while five had moderate to severe abnormalities, and one had fibrosis. BSP values ranged from 3-8 and folate values ranged from less than 2 to 7. The average age of those with mild or no abnormalities was 37 yr and of those with moderate to severe abnormalities 56 yr. Of seven patients with over 8 g total dosage, two had no or mild abnormalities, one moderate to severe, and four fibrosis. BSP values were from 4-11 and folate 4-9. Four patients with over 5 g total dosage presented with cirrhosis. In these, BSP values were from 20-50. It is concluded that large doses of methotrexate are not always hepatotoxic, that damage may increase with age, and that biopsy is the best method for detecting liver damage.

3430 PRESENT-DAY STATE OF THE PROBLEM OF TOXIC HEPATITIS. *(Rus.)* Konchalovskaya, N. M.; Popova, T. V.; Byalko, N. K. (Inst. Ind. Hyg. Occup. Med., Moscow, USSR). *Gig. Tr. Prof. Zabol.* (12):10-13, 1974.

3431 THE VALUE OF ENZYMATIC TESTS IN DIAGNOSIS OF TOXIC HEPATOCELLULAR DAMAGE. *(Pol.)* Chrostowski, K.; Milewski, B. (CMKP, Warsaw, Poland). *Pol. Tyg. Lek.* 29(41):1737-1740, 1974.

3432 AN UNUSUAL CASE OF HEPATIC ACTINOMYCOSIS. *(Pol.)* Dolinski, J.; Kociatkiewicz, P.; Wiercinski, J. (Acad. Med., Wroclaw, Poland). *Wiad. Lek.* 27(15):1399-1402, 1974.

3433 ACUTE GONORRHEAL PERIHEPATITIS: LAPAROSCOPIC FINDINGS. *(Ger.)* Jenny, S.; Ammann, R.; Deyhle, P.; Schmid, J. (Canton. Hosp., Zurich, Switzerland). *Z. Gastroenterol.* 12(8): 623-624, 1974.

3434 FATAL HEPATIC NECROSIS FOLLOWING THERAPY WITH TRIMETHOPRIM-SULPHAMETOXAZOLE MIXTURE. *(It.)* Colucci, C. F.; Lo Cicero, M. (Maria della Pace Hosp., Naples, Italy). *Policlinico* 81(3):150-161, 1974.

3435 INJURIES TO THE LIVER. THERAPEUTIC PROBLEMS. VALUE OF ANGIOGRAPHY IN 50 CASES. *(Fr.)* Le Neel, J. C.; Leborgne, J.; Mitard, D.; Visset, J. (Reg. Hosp. Cent., Nantes, France). *J. Chir. (Paris)* 107(4):397-408, 1974.

3436 THE EFFECTS OF FLUORINATED ANESTHETICS ON THE LIVER AND KIDNEYS. *(E.)* Gottlieb, L. S.; Trey, C. (Boston City Hosp., Mass.). *Ann. Rev. Med.* 25:411-429, 1974.

3437 PARACETAMOL (ACETAMINOPHEN) AND THE LIVER. *(E.)* Anonymous. *Br. Med. J.* 1(5957):536-537, 1975.

3438 DECREASING MORBIDITY AFTER LIVER TRAUMA. *(E.)* Drezner, A. D.; Foster, J. H. (Hartford Hosp., Conn.). *Am. J. Surg.* 129(4):483-489, 1975.

3439 COMPLICATIONS OF LIVER RESECTION FOR TRAUMA. *(E.)* Heslop, J. H. (Univ. Otago Med. Sch., Dunedin, New Zealand). *Aust. NZ J. Surg.* 44(4):329-335, 1974.

See also, 3287, 3354, 3460, 3470, 3477, 3756, 3757.

LIVER AND BILIARY TRACT

Acute Viral Hepatitis

3440 INCIDENCE AND NATURE OF CYTOPLASMIC HEPATITIS B ANTIGEN IN HEPATOCYTES. *(E.)* Gerber, M. A.; Hadziyannis, S.; Vernace, S.; Vissoulis, C. (VA Hosp., Bronx, N.Y.). *Lab. Invest.* 32(2):251-256, 1975.

Liver specimens from patients with various forms of hepatitis B antigen (HB Ag) positive or negative liver diseases were examined to determine the incidence and significance of ground-glass hepatocytes. Liver biopsy specimens (177) from 172 patients, and 6 liver necropsy specimens were fixed in formalin and stained with hematoxylin and eosin and Gomori's aldehyde fuchsin. In addition, 10 specimens were stained with orcein, 25 with methyl green-pyronin, and 25 were given the Fuelgen reaction. Direct fluorescent antibody staining for HB Ag was performed on frozen sections from 13 carriers, and on all HB Ag-seropositive patients with chronic hepatitis. Electron microscopy was performed on glutaraldehyde or formaldehyde fixed and osmium tetroxide post-fixed specimens from three carriers and eight HB Ag-seropositive patients with chronic hepatitis. Ground-glass hepatocytes were detected in 32 specimens in varying numbers. Aldehyde-fuchsin-positive ground-glass hepatocytes were found in all 14 HB Ag carriers and 16 of 60 HB Ag-seropositive patients with chronic hepatitis with or without cirrhosis. None were found in 24 patients with HB Ag-seronegative chronic hepatitis, 33 patients with HB Ag-seropositive or negative acute viral hepatitis, five patients with primary biliary cirrhosis, or 14 patients with drug-induced hepatitis with or without cirrhosis. In two HB Ag-seropositive patients, ground-glass hepatocytes were present in non-neoplastic tissue surrounding a hepatocellular carcinoma. Of 16 HB Ag-seropositive patients with chronic hepatitis and ground-glass hepatocytes, 14 had chronic aggressive hepatitis and two had chronic persistent hepatitis. Ground-glass hepatocytes were more numerous in carriers than in chronic hepatitis patients; in eight of 14 carriers over 5% were aldehyde-fuchsin positive, while only three of 16 chronic hepatitis patients were over 5% positive. Cytoplasmic fluorescence was detected in 13 carriers and in six of 11 HB-positive patients with chronic hepatitis, corresponding in percentage and distribution pattern to the aldehyde-fuchsin positive ground-glass hepatocytes. Electron microscopy showed numerous 20-30 nm tubular and circular structures surrounded by dilated endoplasmic reticulum in the hepatocytic cytoplasm of three carriers and one HB Ag-seropositive patient with chronic hepatitis. It is concluded that HB Ag is detectable by light microscopy as Gomori's aldehyde fuchsin-positive ground-glass appearance of hepatocytic cytoplasm.

3441 ULTRASTRUCTURAL STUDY OF CYTOPLASMIC INCLUSIONS IN CASES OF VIRAL HEPATITIS AND HEPATOMAS. *(E.)* Scotto, J.; Homberg, J. C.; Stralin, H.; Caroli, J. (INSERM, St. Antoine Hosp., Paris, France). *Pathol. Eur.* 9(3):211-216, 1974.

Liver biopsies taken from 32 severe cases of viral hepatitis, 2 cases of chronic agressive hepatitis, and 2 cases of hepatoma, all at least 24 hr before death, showed hepatocellular cytoplasmic inclusions. Specimens were examined by electron microscopy after fixation in glutaraldehyde and/or osmium tetroxide, and by light microscopy after staining in hematoxylin and eosin. Cytoplasmic inclusions with generally round or oval shapes, and no limiting membranes were observed in many of the hepatocytes from the cases of hepatitis. The structure of these inclusions was homogeneous, granular and fibrillar in varying ratio, with the granular component frequently dominant. Mallory bodies, which the inclusions resemble, in contrast have more irregular outlines, commonly are serpiginous in form, and are largely fibrillar with longer and broader fibrils (140-165 Å). The fibrils of the inclusions were short and never thicker than 80 Å, and the granules varied from 15-200 Å. Light microscopy showed the inclusions to be faintly gray, rather than brilliantly eosinophilic like Mallory bodies. The number of inclusions varied from cell to cell without apparent relation to the lobule. In the hepatomas, the inclusions were seen in poorly differentiated tumor cells not showing fatty infiltration. It is concluded that these inclusions are not Mallory bodies, and may represent stored viral material.

3442 TOLERANCE TO HEPATITIS B ANTIGEN: A HYPOTHESIS FOR ITS TERMINATION WITH 'IMMUNE-RNA'. *(E.)* Vyas, G. N.; Ibrahim, A. B.; Rao, K. R.; Schmid, R. (Sch. Med., Univ. California, San Francisco). *Life Sci.* 15(2):261-266, 1974.

An hypothesis is postulated based mainly on previously published reports, on the mechanism of acquiring tolerance to hepatitis B surface antigen (HB$_s$Ag) and a possible approach for terminating this tolerance is proposed. Immunologic tolerance to HB$_s$Ag, evidenced by a lack of specific cellular and humoral immune response to HB$_s$Ag, produces a chronic carrier state which serves as an epidemiologic reservoir for the transmission of viral hepatitis type B. In patients with Down's syndrome, uremia, leprosy, renal transplants, chronic active hepatitis, leukemias, and other malignancies, HB$_s$Ag may persist in the plasma for extended periods of time. This persistence is ascribed to genetically determined or acquired impairment of cell-mediated immunity. In apparently healthy carriers the mechanisms of HB$_s$Ag formation and persistence in the plasma are obscure. The observation of neonatal onset of the chronic carrier state suggests that the fetus may acquire immunologic tolerance to HB$_s$Ag as a result of exposure to HB$_s$Ag during a critical period of its intrauterine life. Slow viral infection with lymphocytic choriomeningitis virus in mice provides an analogous model suggesting immunologic tolerance mediated by T-cells. It is proposed that cell-mediated immunity may be transferred to tolerant individuals with "immunoinformational" RNA derived from leukocytes of persons with demonstrable cell-mediated immunity. Adoptive transfer of cell-mediated immunity with the transfer factor has been unsuccessful in an asymptomatic chronic carrier; however, maternal transfer factor has been reported to cause a 95% reduction of HBsAg over a 4-month period in a patient with neonatally acquired hepatitis B infection. The effectiveness of this immunoinformational RNA for transfer of cell-mediated immunity to chronic carriers could be assessed *in vitro* by leukocyte migration inhibition techniques and in HB$_s$Ag-positive chimpanzees *in vivo*. If these *in vitro* and *in vivo* studies should demonstrate the efficacy and safety of the proposed procedure, it is suggested that immunoinformational RNA be tested for terminating the chronic carrier state in man.

3443 DELAYED HYPERSENSITIVITY IN HEPATITIS B: CLINICAL CORRELATES OF IN VITRO PRODUCTION OF MIGRATION INHIBITION FACTOR. *(E.)* Irwin, Jr., G. R.; Hierholzer, Jr., W. J.; Cimis, R.; McCollum, R. W. (Yale Univ. Sch. Med., New Haven, Conn.). *J. Infect. Dis.* 130(6):580-587, 1974.

Delayed hypersensitivity to hepatitis B surface antigen (HB$_s$Ag) in patients with disease from the clinical spectrum of hepatitis and in controls was examined by an indirect assay of macrophage migration inhibitory factor (MIF). Patients with HB$_s$Ag-positive acute hepatitis and HB$_s$Ag-positive or -negative persistent hepatitis produced MIF. MIF activity was not detected in patients who were receiving steroids or in pregnant patients with acute HB$_s$Ag-positive hepatitis. Patients with a documented history of HB$_s$Ag-positive mild hepatitis (6 months to 2 yr previous) but without continuing clinical or laboratory evidence of liver disease did not demonstrate MIF. Patients with acute hepatitis epidemiologically related to ingestion of shellfish and without a history of drug use or exposure to blood products did not produce MIF. Individuals with antibody to HB$_s$Ag detectable by hemagglutination and/or precipitation in agar gel did not make MIF, nor did antibody-negative normal controls. In one individual, mistakenly given a unit of HB$_s$Ag-positive blood, MIF was not detectable on 2 occasions before the appearance of clinical illness. During and shortly after clinical illness, MIF was present; it was undetectable again 72 days after disappearance of abnormal liver function and clinical signs and symptoms. Results from all categories of patients were reproducible; however, in some cases the degree of inhibition in the second test was lower than in the original test. Thus the ability to detect MIF seemed dependent on the presence of clinical illness at the time of the assay.

3444 NEONATAL HEPATITIS TYPE B--A THREE YEAR FOLLOW-UP. *(E.)* Dahlquist, E.; Nordenfelt, E. (Dep. Infect. Dis., Univ. Lund, Sweden). *Scand. J. Infect. Dis.* 6(4):305-308, 1974.

Counterelectrophoresis and immunodiffusion techniques were used to detect hepatitis B antigen (HB Ag) in 2 cases of newborn children of mothers with hepatitis during pregnancy. The first case was a 31-yr-old woman who developed acute hepatitis during the eighth month of pregnancy. HB Ag subtype *y* was detected in her serum. About a month later she gave birth to a premature but normal female infant. HB Ag subtype *y* was not detected in the infant's serum until about 2 months later. A liver biopsy at 2.5 yr disclosed chronic persistent hepatitis, but she has had normal development and good general condition. The second case was a 40-yr-old woman who developed acute hepatitis in the seventh month of pregnancy. HB Ag subtype *y* was again found in the serum. She gave birth to a normal male infant who became positive for the antigen 33 days after delivery. A liver biopsy about 10 months later disclosed chronic hepatitis, but a second biopsy a month later showed no sign of disease. Although long term effects of neonatal hepatitis are unknown, prognosis appears to be good.

3445 THE EPIDEMIOLOGICAL IMPORTANCE OF 'ay' AND 'ad' SUBTYPES OF THE HB-Ag. *(E.)* Pons-Romero, F.; Heathcote, J.; Sherlock, S. (R. Free Hosp., London, England). *Gut* 15(9):733-736, 1974.

The distribution of the subtypes *ay* and *ad* was assessed in 159 hepatitis B antigen (HB Ag) positive subjects with a variety of associated hepatic conditions. Sixty-nine patients were diagnosed as having acute hepatitis, 17 were healthy carriers, 41 had chronic aggressive hepatitis, 27 had chronic persistent hepatitis, and 5 had primary liver cell cancer. The subjects fell into 1 of 4 geographical groups: 71 came from northern Europe, 57 from Mediterranean countries, 8 from the Middle East, and the remaining 16 from a variety of countries not in these regions. All serum samples were set up against *y* and *d* antisera and tested by counterimmunoelectrophoresis. All of the HB Ag-positive samples could be subtyped either *ay* or *ad*. When the subtyping results from all 159 subjects were considered, there was no significant dishomogeneity between *ay*:*ad* proportions in the various diagnostic groups. However, when compared according to geographic regions, the ratio *ay* to *ad* was significantly greater in the Mediterranean subjects. Differences in the distribution of the two subtypes were also seen within each diagnostic group when its members from northern Europe and the Mediterranean areas were compared. Among the patients with acute hepatitis, this difference in distribution of the two subtypes did not emerge until the patients were separated as to where they were thought to have contracted hepatitis. In nine households where intra-household, non-parenteral transmission of the HB Ag was suspected, the subtype was the same within each household; five were all *ay* and four were all *ad* in type. These results demonstrate that both subtypes may be associated with all forms of HB Ag-positive acute and chronic liver disease and present in healthy carriers. However, the geographical origin of the HB Ag-positive person, and possibly the route of infection with the HB Ag, may influence the subtype findings in any one area. It is suggested that subtype *ay* predominates in

Mediterranean areas while *ad* predominates in northern Europe. It is suggested therefore that infection with a particular subtype of the hepatitis B virus is associated with epidemiological factors and cannot be related to any particular form of hepatic pathology.

3446 HYBRIDISATION OF DANE PARTICLE DNA WITH THE FREE PLASMA DNA OF HEPATITIS CARRIERS.

(E.) Hung, P. P.; Mao, J. C. H.; Ling, C. M.; Overby, L. R. (Dep. Virol., Abbott Lab., North Chicago, Ill.). *Nature* 253(5492):571-572, 1975.

Plasma from commercial donors were screened for Hepatitis B surface antigen (HB$_s$Ag) by radioimmunoassay. Positive specimens were then screened for free DNA by dialysis of 50 ml plasma against Tris buffer containing .01% diethylpyrocarbonate. Cesium chloride was added to the dialyzed plasma to an average density of 1.05 and the solution was centrifuged for 67 hr at 3500 rpm. Synthesis and isolation of ^{3}H-thymidine from Dane particles was also carried out, and this labeled DNA was hybridized with the free DNA isolated from the plasma. Both DNA samples were denatured separately with NaOH, neutralized with HCl, and incubated together in 1 x SSC for 4 hr at 68 C. Unhybridized DNA was digested, and calf thumus DNA was added as a carrier. Radioactivity was determined by scintillation spectrometer. The free isolated DNA possessed homology with the labeled Dane particle DNA, but not with samples of DNA from human liver, WI-38 cells, salmon sperm, or calf thymus. Of 21 HB$_s$Ag-positive plasma samples, all had detectable free DNA of which five randomly selected samples were hybridizable with Dane particle DNA. In contrast, 19 of 21 HB$_s$Ag-negative samples had no detectable free DNA. The remaining 2 had free DNA hybridizable with Dane particle DNA. The length of the free plasma was estimated at 2-3 μm, longer than that of the Dane particle genome, equivalent to a molecular weight of 4 x 10^6 to 5 x 10^6. The results suggest the possibility of using molecular hybridization with immunological techniques to determine potential blood plasma infectivity.

3447 HEPATITIS B ANTIGEN AND ANTIBODY IN MATERNAL BLOOD, CORD BLOOD, AND AMNIOTIC FLUID.

(E.) Papaevangelou, G.; Kremastinou, T.; Prevedourakis, C.; Kaskarelis, D. (Dep. Hyg. Epidemiol., Univ. Athens, Greece). *Arch. Dis. Child.* 49(12):936-939, 1974.

Transmission of hepatitis B virus from carrier mothers to their newborns was studied using hepatitis B antigen (HB Ag) and antibody (HB Ab) in maternal blood, umbilical cord blood, and amniotic fluid. A random sample of 428 women had maternal and umbilical cord bloods drawn. Sixty-nine also had amniotic fluid drawn at delivery and concentrated 10 times. HB Ag was detected by counter-immunoelectrophoresis. Passive hemagglutination assay was used to screen for HB Ab in 173 mothers. HB Ag was not detected in the umbilical cord blood of the antigen-negative mothers, but was shown to be in the umbilical cord blood of two of the 14 newborns of permanent antigen carrier mothers. The antigen was not in blood samples drawn 3 months after delivery of the infants from the carrier mothers, or from the two infants who had positive cord blood. HB Ab was absent in the umbilical blood of one of 38 HB Ab-positive mothers, and was not found in maternal or umbilical blood or amniotic fluid of any of the HB Ag-positive cases. HB Ab was also absent from the amniotic fluid of 59 negative mothers and three of 10 positive mothers. HB Ab titers were significantly lower in amniotic fluid than in maternal or umbilical blood. There was not correlation between HB Ab titers of umbilical blood and amniotic fluid. It is concluded that transplacental transmission from carriers is not uncommon, occurs through exposure of the fetus to the virions, and that antibody to the hepatitis b virus easily crosses the placental barrier.

3448 THE SIGNIFICANCE OF INVOLVEMENT OF THE INTRAHEPATIC BILE DUCTS IN THE GENESIS OF JAUNDICE AND CHOLESTASIS IN VIRAL HEPATITIS.

(Ger.) Bluger, A. F.; Kartasova, O. J.; Maksimova, L. A. (Med. Inst., Riga, USSR). *Dtsch. Z. Verdau. Stoffwechselkr.* 34(1):9-16, 1974.

Clinical symptoms and the findings from liver biopsies were compared in 260 patients with acute viral hepatitis: 70 had the anicteric form and 190 were jaundiced. Signs of cholestasis (pruritus and increased serum alkaline phosphatase, cholesterol, β-lipoprotein, and copper levels) were present in 43 of the 90 patients with jaundice. Changes in intrahepatic bile ducts were detected in 73% of all patients, including 87% of those with jaundice and in 37% of those with anicteric hepatitis. These changes consisted of epithelial abnormalities (cytoplasmic swelling and granulation, nuclear pyknosis, and karyolysis) and desquamation of epithelial cells into the intrahepatic bile ducts; a pronounced mesenchymal reaction; inclusions of neutral lipids and glycoproteins in the cytoplasm of bile duct cells; an increased alkaline phosphatase activity in the walls of the bile ducts; and cytochrome oxidase activity in periductal cell infiltrates. Under the electron microscope, shrinking of the nuclei, vacuolization of bile duct cells, and many fragments of desquamated cells in the lumen were evident. These forms of cholangitis are characterized as (1) catarrhal, (2) obstructive, or (3) destructive. Only catarrhal cholangitis was present in 93% of those with cholestatic hepatitis. The high incidence of obstructive cholangitis in these patients suggests that bile duct lesions interfere with normal production of bile and prevent bile flow in hepatitis. Obstructive cholangitis was also found in 67% of all jaundiced patients, but destructive cholangitis occurred in only one patient with cholestasis. Mathematical analysis of the relation between bile duct lesions and the increase in bilirubin levels showed a close correlation between intact bile ducts or catarrhal cholangitis and bilirubin levels of 5 mg/100 ml or less and a direct correlation between obstructive cholangitis and bilirubin levels of 5 to 10 mg/100 ml or over 10 mg/100 ml. Obstructive cholangitis occurred in 55% of patients with cytolysis syndrome (increased SGOT and iron levels and abnormal thymol turbidity tests). Cytolysis was not related to bile duct lesions, but cholestasis, either alone or accompanied by cytolysis syndrome was correlated with obstructive cholangitis.

3449 SUBTYPES OF HEPATITIS B ANTIGEN AMONG PATIENTS AND SYMPTOMLESS CARRIERS. *(E.)*

Green, H. T.; Turner, G. C. (Fazakerley Hosp., Liverpool, England). *J. Hyg. (Camb.)* 74(1):123-132, 1974.

The relationship between the forms of hepatitis B infection and the *ad*, *ay* and *a* subtypes associated with them were studied in 255 subjects. Of these, 127 had chronic liver disease or were symptomless hepatitis B antigen (HB Ag) carriers, two were infants of HB Ag-positive mothers who became positive at about 2 months of age, and one was an adult with transient antigenemia but no evidence of hepatitis. HB Ag-positive sera were identified by immunoelectrophoresis and subtyped by immunodiffusion using hepatitis B antibody positive sera that gave spurs characteristics of partial identity reactions between preciptin lines with reference to *ad* and *ay* HB Ag-positive sera. The 127 acute hepatitis patients fell into four categories: blood transfusion; illegal drug injections or social intercourse with addicts; miscellaneous parenteral exposure; and contact with HB Ag-positive patients undergoing hemodialysis. Subtypes were found with equal frequency in those with no parenteral exposure and those with blood transfusions, but subtype *ay* was predominant in those with illegal drug injections (100%), social contact with addicts (91%), and such miscellaneous parenteral exposure as tattooing, injections, or accident in medical or dental practice (80%). All hemodialysis cases were *ay* but were all from the same hemodialysis unit. Of 34 post-transfusion cases, 2 groups received their transfusions in Liverpool and North Wales and had subtype *ad* in 64% and 60%, resp. A third group received blood elsewhere, and 70% of them had subtype *ay*. The chronic hepatitis patients fell into 3 categories: symptomless carriers of HB Ag; patients with chronic liver or other diseases; and patients with chronic renal failure on hemodialysis. Of the symptomless carriers, 78% were *ad*, 21% *ay* and 1% *a*. The patients with chronic liver diseases were 55% *ad* and 45% *ay*, and those with non-liver diseases were 71% *ad* and 29% *ay*. All the hemodialysis patients were subtype *ay* but all were in 1 hemodialysis unit. The results confirm previous reports that subtype *ad* is associated largely with chronic or symptomless infection, while subtype *ay* is associated with acute hepatitis.

3450 CONTENT OF TOTAL SERUM HEXOSES BOUND WITH PROTEINS AND THEIR URINARY EXCRETION IN PATIENTS WITH VIRAL HEPATITIS (BOTKIN'S DISEASE).

(Rus.) Fedianin, Iu. P.; Rabinovich, P. D.; Vaistukh, S. I. (Chita Med. Inst., USSR). *Ter. Arkh.* 46(4):63-67, 1974.

The total content of serum hexoses and their urinary excretion was investigated in 67 patients with acute viral hepatitis. The total serum content was 186.0 mg% at the height of the disease; 168.0 mg% after the disappearance of jaundice; and 184.0 mg% during convalescence. The urinary excretion of hexoses in the patients at the height of the disease was nearly twice that of the healthy people (1.066 mg/day and 548.2 mg/day, resp.). During convalescence, the urinary excretion of hexoses was lower (734.0 mg/day) than it was at the height of the disease, but exceeded that of the healthy subjects. The findings also indicate that urinary excretion of hexoses bound with biopolymers and their concentration in the urine of patients was more than 1.5 times higher at the height of the disease than in the healthy people (84.3 mg and 15.7 mg%; 49.5 mg and 9.1 mg%, resp.). During the convalescent period these indices returned to normal (62.8 mg and 10.6 mg%). It is suggested that in patients with acute viral hepatitis, the concentration of serum hexoses bound with proteins increases, while their urinary excretion rises at all stages of the disease. During the convalescent period, the enzyme hexose content and their urinary excretion remain elevated, while the indices of metabolic pigment and proteins return to normal. The total content of hexoses bound with the proteins may be indicative of the severity of the destructive changes in the acute stage of the disease and of the degree of the regenerative processes in the liver during convalescence.

3451 DETECTION AND PATHOGENIC ROLE OF CIRCULATING IMMUNE COMPLEXES INVOLVING HEPATITIS B SURFACE ANTIGEN.

(E.) Trepo, V. C.; Prince, A. M. (New York Blood Cent., N.Y.). *Z. Gastroenterol.* 13: 278-281, 1975.

The role of circulating immune complexes involving the hepatitis B surface antigen (HB$_s$Ag) in the pathogenesis of liver and kidney disease was investigated. Such circulating complexes have been demonstrated in patients positive for HB$_s$Ag or anti-HB$_s$. SGPT levels were compared in 60 asymptomatic chronic HB$_s$Ag carriers with coexisting anti-HB$_s$ and 60 HB$_s$Ag carriers without detectable anti-HB$_s$. The SGPT values did not differ significantly between the two groups, and assessment of hepatic damage by liver biopsy in 70 HB$_s$Ag carriers confirmed the lack of correlation between anti HB$_s$ and evidence of liver disease. When 300 ml of high titer anti-HB$_s$-containing plasma from a hyperimmune chimpanzee was infused into a healthy chronic HB$_s$Ag carrier animal, there was no significant rise in the animal's SGPT values. Thus, circulating HB$_s$Ag/Ab complexes are probably not particularly pathogenic for the liver, although they presumably are involved in the pathogenesis of various extrahepatic manifestations which may be associated with HB$_s$ antigenemia (e.g., vasculitis, polyarthritis, glomerulonephritis). The previously observed dissociation between usually mild anicteric hepatitis and severe lesions of vasculitis and/or glomerulonephritis in patients with periarteritis nodosa or glomerulonephritis associated with persisting HB$_s$ antigenemia suggest that the hepatic and extrahepatic lesions of hepatitis B are probably mediated by two different immunopathogenic mechanisms; circulating HB_sAg complexes are probably only responsible for the latter.

3452 CLINICO-PATHOLOGICAL STUDIES OF THE LIVER IN ASYMPTOMATIC CARRIERS OF AUSTRALIA ANTIGEN (HBAg).

(E.) Ichida, F.; Sasaki, H.; Sekine, T.; Inagaki, T.; (Sch. Med., Niigata Univ., Japan). *Acta Hepatogastroenterol. (Stuttg.)* 22(1):13-21, 1975.

Blood donors (55 males, 1 female) who were carriers of the Australia antigen (HB_sAg) and had normal SGPT values were examined clinically, immunologically, and histologically. Among these subjects, the SGPT was abnormal in 14.5% of the cases, the SGOT was abnormal in 9%, the serum bilirubins were abnormal in 12.2%, the serum alkaline phosphatase level was abnormal in 24.5%, the tolbutamide tolerance test in 4.4%, the ZTT was abnormal in 2.2%, the γ-globulin was abnormal in 21.2%, and the indocyanine green retention was abnormal in 25.6%. Anti-HB_s was negative in all subjects and the rate of lymphocytic blastogenesis in the peripheral blood was low in seven of 19 patients. The migration inhibitory factor test determined by the addition of purified HB_sAg revealed that 17 subjects, excluding one with a histologic picture of acute hepatitis, were not susceptible to HB_sAg. Histologic examinations of liver biopsies in 20 subjects showed nonspecific reactions in seven, acute viral hepatitis in one, and fatty liver in two. Acute viral hepatitis accompanied by very slight inflammatory reactions in the lobules was found in eight subjects, and pleomorphism was noted in the hepatocytes of eight. It is probable that the low humoral and cell-mediated antibody titers to HB_sAg in asymptomatic carriers of HB_sAg are involved in the mechanism of continuous HB_sAg positivity.

3453 HEPATITIS B: A NEW VACCINE READY FOR HUMAN TESTING.

(E.) Maugh, II, T. H. (no affil.). *Science* 188(4184):137-138, 1975.

Viral antigens isolated from human carriers of hepatitis B have been used to prepare a vaccine against this disease. Available evidence indicated that the nucleic acid core of the presumed hepatitis virus replicates in the nucleus of liver cells and migrates to the cytoplasm, where it is sheathed in the protein coat of the hepatitis B surface antigen (HB_sAG or Australian antigen). Early work showed that injections of blood serum from chronic human carriers of HB_sAg protected 70% of a group of children who were later exposed to hepatitis. The new vaccine was prepared by separation of the antigen from viral particles in the blood by centrifugation, purification of the antigen by centrifugation or a chemical procedure, and treatment of the antigen with formalin to inactivate any remaining virus particles. Of four chimpanzees given the vaccine, all developed antibodies to HB_sAg and none developed hepatitis; one animal given a vaccine which had not been exposed to formalin did develop hepatitis. Six months later, all animals were given an infectious dose of hepatitis B virus subtype *ayw*. None of the animals given vaccine prepared from subtype *ayw* developed hepatitis. Although one animal given vaccine prepared from subtype *adr* did become infected, it developed none of the signs of the disease. The next step will be limited testing in humans to ensure that the vaccine is safe. If it is found safe and effective in humans, it can be used to protect individuals who are likely to come into contact with the hepatitis virus.

3454 ACUTE VIRAL HEPATITIS: FACTORS POSSIBLY PREDICTING CHRONIC LIVER DISEASE.

(E.) Dietrichson, O.; Juhl, E.; Christoffersen, P.; Elling, P.; Faber, V.; Iversen, K.; Nielsen, J. O.; Petersen, P.; Poulsen, H. (Kommunehosp., Copenhagen, Denmark). *Acta Pathol. Microbiol. Scand.* [*A*] 83(1):183-188, 1975.

Clinical, biochemical, immunological, and morphological variables recorded at first hospital admission were compared in 74 patients with uncomplicated acute viral hepatitis and in 28 patients who subsequently developed chronic liver disease. Clinically, the only difference between the two groups was a higher percentage of drug addicts in the group with subsequent chronic liver disease. Although there were some biochemical differences between the two groups, only the highest registered bilirubin values showed a significant difference; they were highest in the group with subsequent morphological normalization. The group that subsequently developed chronic liver disease had significantly higher maximal γ-globulin values, a significantly higher incidence of antinuclear antibodies and smooth muscle antibodies, a significantly higher incidence of Australia antigen subtype Y, and a nonsignificantly higher incidence of Australia antigens of all subtypes. The group which subsequently developed chronic liver disease also showed a higher incidence of defect limiting plate, piecemeal necrosis, and pronounced plasma cell infiltration in the portal tracts on biopsy. The results suggest that the immunological and more detailed morphological changes which distinguish the two groups at the start of acute viral hepatitis are, to some extent, the same as those which are of importance in predicting the prognosis of chronic hepatitis.

3455 HEPATITIS B VIRUS ANTIGEN QUANTITATION BY RADIOIMMUNOASSAY (RIA) IN VIRAL HEPATITIS AND IN CHRONIC LIVER DISEASE.

(E.) De Ritis, F.; Gravina, E.; Squame, G. (2nd Med. Sch., Univ. Naples, Italy). *Acta Hepatogastroenterol. (Stuttg.)* 22(1): 4-13, 1975.

Immunological techniques and a solid-phase radioimmunoassay were used to study the incidence of the hepatitis B viral antigen (HB Ag) in 70 patients with viral hepatitis, 13 patients with chronic active hepatitis, and 20 patients with cirrhosis. As demonstrated by radioimmunoassay, 90% of the patients with posttransfusion hepatitis, 88% of those with acute viral hepatitis, and 35% of those with cirrhosis were positive for HB Ag. In each group, agar gel diffusion, counter immunoelectrophoresis, and complement fixation tests showed a lower percentage of HB Ag-positive cases. The degree of antigenemia was determined using a linear plot of the percent of $[^{125}I]$ HB Ag count bound *versus* increasing dilutions of HB Ag-positive controls. The resulting dose-response curves were used to follow-up 15 patients suffering from acute hepatitis. In the first week, circulating levels of HB Ag were distributed into three classes of values; this distinction was less evident in the following weeks. The concentrations of HB Ag became progressively lower with time, reaching nondetectable levels by the eighth week. Radioimmunoquantitation of HB Ag in the sera of patients with chronic active hepatitis showed a wide range of antigenemia (17-5100 ng/Eq/ml *ad*) in 13 patients. Use of a dose-response standard curve also improved the sensitivity of the radioimmunoassay technique in patients with cirrhosis. The results indicate that radioimmunoassay is more sensitive than other immunological methods for the detection of HB Ag in acute and chronic hepatitis.

3456 IS THERE A RISK OF TRANSMITTING HEPATITIS BY GASTRODUODENOSCOPY? *(Ger.)* Massarat, S.; Urban, M.; Schiff, W. (Med. Polyclin., Univ. Marburg/Lahn, Germany). *Dtsch. Med. Wochenschr.* 100(2): 42-45, 1975.

The risk of transmitting virus-B hepatitis by gastroduodenoscopy was studied in 211 patients who underwent gastroduodenoscopy by using the same endoscope for all patients. After use, the endoscope was sterilized by a routine method, including washing with tap water, immersion in a disinfectant solution for 20-30 min, and final cleaning with 70% alcohol. Five patients had been carriers of Australia antigen (HB_s Ag) before gastroduodenoscopy. The follow-up examinations carried out 2 and 4 months after gastroduodenoscopy revealed HB_sAg in the same five patients, and in two additional patients who, however, had been subjected to this examination before the HB_sAg carriers. One of the two new HB_sAg-positive patients had liver cirrhosis; multiple infusions of albumin had been carried out in the other after gastroscopy. In this case, infusion may have been the cause of HB_sAg transsion. No proven case of hepatitis transmission occurred in this group of patients. The findings indicate low probability of hepatitis transmission at gastroduodenoscopy, and no need for preliminary HB_s Ag tests prior to gastroscopy.

3457 SUBACUTE NECROTIZING HEPATITIS: DIAGNOSIS, COURSE, AND PROGNOSIS. *(Ger.)* Lammli, J.; Vetter, D.; Knoblauch, M.; Schmid, M. (Waid Munic. Hosp., Zurich, Switzerland). *Helv. Med. Acta.* 37(5/6); 403, 1974.

The pathogenesis, symptomatology, therapy, and prognosis of subacute necrotizing hepatitis in 18 female and 4 male patients are described. Serious and protracted jaundice, prolonged impairment of the general health status with asthenia, nausea, and anorexia were the principal symptoms of the disease. Hepatomegaly and splenomegaly were detected in 2/3 and in 1/3 of all cases, resp. Portosystemic encephalopathy, ascites, and edema were frequent, and the bilirubin levels reached an average maximum of 21 mg% in 4.5 weeks. The γ-globulin levels sometimes reached values commonly observed in chronic aggressive hepatitis. Almost 50% of all patients were Australia antigen-positive. The causative agent was determined to be oxyphenisatin-base laxatives in two cases. Organ-unspecific antibodies without prognostic significance were temporarily present in 1/3 of all patients. Three patients died in hepatic coma after 5 weeks. Follow-up examinations after 18 months revealed full recovery in five cases, scarred liver in five, chronic aggressive hepatitis in four, and chronic persistent hepatitis in three cases. Corticosteroid therapy was successful in 13 patients.

3458 CHANGES IN THE GAS COMPOSITION OF THE BLOOD DURING VIRAL HEPATITIS. *(Rus.)* Metreveli, K. M. (Repub. Clin. Infect. Dis., Min. Health Georgian SSR, USSR). *Soobshch. Akad. Nauk Gruz. SSR* 76(2):457-460, 1974.

3459 CHANGES OF THE ACTIVITY RATIO OF LACTATE DEHYDROGENASE ISOENZYMES LDG_5/LDG_4 IN LIVER DISEASES. *(Rus.)* Tsarapkin, M. I. (Reg. Mil. Hosp., Odessa, USSR). *Vrach. Delo* (11):66-68, 1974.

3460 THE MORPHOLOGICAL PATTERN OF VIRAL AND TOXIC LIVER INJURY. *(Ger.)* Vido, I. (Med. Coll., Hannover, Germany). *Z. Gastroenterol.* 12(8):624, 1974.

3461 WATER-BORNE OUTBREAK OF INFECTIOUS HEPATITIS. *(Rus.)* Nikiforov, V. N.; Paltseva, T. F.; Skavinskii, Iu. V.; Gulman, L. A.; Shilenok, I. G.; Starosotskaia, T. Ia. (Cent. Inst. Postgrad. Med., Moscow, USSR). *Sov. Med.* (9):101-105, 1974.

3462 CLINICAL FEATURES OF VIRAL HEPATITIS IN PATIENTS WITH PEPTIC ULCER. *(Rus.)* Krylova, O. M.; (Leningrad Med. Inst. Sanit. Hyg., USSR). *Sov. Med.* (8):153-154, 1974.

3463 LIVER COMA CAUSED BY FULMINATING HEPATITIS. *(It.)* Berengo, A. (Inst. Infect. Dis., Univ. Milan, Italy). *Terapia (Milano)* 59(426):43-52, 1974.

3464 STUDIES ON THE PREVALENCE OF VIRAL HEPATITIS AMONG PERSONNEL WORKING WITH HUMAN BLOOD. *(Rus.)* Draganov, P.; Teokharova, M.; Astrukova, S.; Losev, B.; Mineva, E.; Peeva, Z. (Med. Acad., Sofia, Bulgaria). *Vrach. Delo* (12):116-120, 1974.

3465 THE DETECTION OF HEPATITIS B ANTIGEN IN RELATION TO HEPATIC INDICATOR ENZYMES IN PATIENTS WITH VIRAL HEPATITIS. *(Ger.)* Boron, P.; Sokolewicz Bobrowska, E.; Dzikowski, M. (Med. Acad., Bialystok, Poland). *Z. Gesamte Inn. Med.* 29(24):997-1040, 1974.

3466 FOLLOW-UP OF HEPATITIS B ANTIGEN DURING AND AFTER ACUTE VIRUS HEPATITIS IN 1964-1972. *(Ger.)* Alexander, M.; Scholz, V.; Wenzel, H. (Dep. Infect. Dis., Free Univ. Berlin, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:977-979, 1973.

3467 PREVALENCE OF HEPATITIS B ANTIBODY IN BLOOD DONORS IN SOUTHWEST GERMANY. *(Ger.)* Frosner, G. G.; Sugg, U.; Schneider, W.; Gerth, H. J. (Hyg. Inst., Univ. Tubingen, Germany). *Munch. Med. Wochenschr* 117(3):81-82, 1975.

3468 GAMMA GLOBULIN PROPHYLAXIS OF INFECTIOUS HEPATITIS. *(Ger.)* Schiiz, R.; Rollinghoff, W. (Paul Lechler Hosp., Tubingen, Germany). *Munch. Med. Wochenschr.* 117(3):77-80, 1975.

3469 CURRENT CONCEPTS OF VIRAL HEPATITIS AND A PEEK INTO THE FUTURE. *(E.)* Koff, R. S. (Boston VA Hosp., Mass.). *Yale J. Biol. Med.* 47(4):252-259, 1974.

3470 CLINICAL PROBLEMS OF TUBERCULOSTATIC THERAPY AND ACUTE VIRUS HEPATITIS. *(E.)* Schondorf, T.; Leinweber, B. (Cent. Intern. Med., Justus Liebig Univ., Giessen, Germany). *Acta Hepatogastroenterol. (Stuttg.)* 21(6):411-418, 1974.

3471 SERUM HEPATITIS (SH) ANTIGEN AMONGST PATIENTS WITH LIVER DISEASES AND VOLUNTARY BLOOD DONORS - A PROSPECTIVE STUDY. *(E.)* Pal, S. R.; Dutta, D. V.; Choudhury, S.; Jolly, J. G.; Deodhar, S. D.; Samant, A. K. S.; Chitkara, N. L.; Chuttani, P. N. (Post-Grad. Inst. Med. Educ. Res., Chandigarh, India). *Indian J. Med. Res.* 61(12):1784-1799, 1973.

3472 ABNORMALITY OF THE STRUCTURE AND COMPOSITION OF PLASMA LIPOPROTEINS (HDL) DURING DIFFERENT TYPES OF HEPATITIS. *(E.)* Hartmann, L.; Ollier, M. P.; Fiessinger, J. N.; Nebut, M. (Chem. Clin., Paris, France). *Biomedicine* 21(12):480-485, 1974.

3473 FULMINANT HEPATITIS ASSOCIATED WITH ACQUIRED DEFECT IN HUMORAL IMMUNITY. *(E.)* Greally, J.; Dillon, J.; Mayne, B. (Meath Hosp., Dublin, Ireland). *Ir. J. Med. Sci.* 143(6):350-355, 1974.

3474 EPIDEMIOLOGY OF HEPATITIS B ANTIGENEMIA IN AN INSTITUTION FOR MENTALLY RETARDED. *(E.)* Tevaluoto-Aarnio, M. (Rinnekoti Inst. Ment. Retard., Univ. Helsinki, Finland). *Scand. J. Infect. Dis.* 6(4):309-313, 1974.

3475 HEPATIC CIRCULATION DURING AND AFTER INFECTIOUS HEPATITIS. *(E.)* Lundbergh, P. (Rolagstull Hosp., Stockholm, Sweden). *Scand. J. Infect. Dis.* 6(4):297-304, 1974.

3476 HEPATITIS-B-ANTIGEN AND CORRESPONDING ANTIBODIES AFTER MULTIPLE BLOOD TRANSFUSIONS. *(Ger.)* Mullis, C. H.; Grob, P. J. (Dep. Intern. Med., Univ. Zurich, Switzerland). *Schweiz. Med. Wochenschr.* 104(30):1053-1060, 1974.

3477 ARTIFICIAL LIVER SUPPORT IN FULMINANT HEPATIC FAILURE. *(E.)* Williams, R. (King's Coll. Hosp. Med. Sch., London, England). *Bull. NY Acad. Med.* 51(4):508-518, 1975.

3478 PATHOLOGY OF VIRAL HEPATITIS AND ITS SEQUELAE. *(E.)* Thaler, H. (Wilhelm Hosp., Vienna, Austria). *Bull. NY Acad. Med.* 51(4):481-490, 1975.

3479 IMMUNOLOGICAL REACTIVITY AND VIRAL HEPATITIS. *(E.)* Sherlock, S. (R. Free Hosp., London, England). *Bull. NY Acad. Med.* 51(4):528-532, 1975.

3480 EPIDEMIOLOGY OF VIRAL HEPATITIS B IN THE TROPICS. *(E.)* Francis, T. I. (Univ. Coll. Hosp., Ibadan, Nigeria). *Bull NY Acad. Med.* 51(4):501-507, 1975.

3481 HEPATITIS A AND B. *(E.)* Carver, D. H.; Seto, D. S. Y. (Johns Hopkins Univ. Sch. Med., Baltimore, Md.). *Pediatr. Clin. North Am.* 21(3):669-681, 1974.

3482 TOWARD HEPATITIS B VACCINES. *(E.)* Zuckerman, A. J.; Howard, C. R. (London Sch. Hyg. Trop. Med., England). *Bull. NY Acad. Med.* 51(4):491-500, 1975.

3483 ENDOGENOUS AND POSTHEPARIN MONOGLYCERIDE HYDROLASE IN PLASMA OF PATIENTS WITH ACUTE VIRUS HEPATITIS. *(E.)* Hansen, W. (Med. Clin. II, Tech. Univ. Munich, Germany). *Klin. Wochenschr.* 53 (3):135-137, 1975.

3484 SPORADIC ENDEMIC OUTBREAKS OF VIRAL HEPATITIS IN ITALY AND IN MARCHE PROVINCE OVER A TWENTY-YEAR PERIOD. FINDINGS AND CRITICAL ANALYSIS OF 8954 CASES REPORTED IN MARCHE FROM 1960 TO 1969 AND OF 949 CASES REPORTED IN ANCONA FROM 1957 TO 1969. *(It.)* Russi, F.; Svegliati Baroni, A. (Munic. Hosp., Ancona, Italy). *Minerva Med.* 65(90):4779-4795, 1974.

See also, 2875, 3348, 3354, 3361, 3521, 3537, 3549.

LIVER AND BILIARY TRACT

Chronic Hepatitis

3485 IMMUNOGLOBULINS, GLYCOPROTEIDS [SIC!] AND AUSTRALIA ANTIGEN IN CHRONIC LIVER DISEASE. *(E.)* Feher, J.; Jakab, L.; Szilvasi, I. (Semmelweis Univ. Med. Sch., Budapest, Hungary). *Acta Med. Acad. Sci. Hung.* 30(3):197-203, 1973.

The sera of 91 patients with chronic liver disease (16 chronic persistent hepatitis, 25 chronic aggressive hepatitis, 30 cirrhosis of the liver, and 20 fatty infiltration) were studied by radial diffusion to estimate the amount of IgG, IgA, and IgM immunoglobulins, and ceruloplasmin, α_2-macroglobulin, β_1-C-globulin and transferrin. Microcomplement fixation was used to demonstrate the presence of Australia antigen (HB_SAg) and antibody. The titers of humoral antibodies against allogenic hepatocellular nuclei, mitochondria, and soluble protein were estimated by passive hemagglutination. Pooled serum from 100 blood donors served as the control. IgA and IgM levels showed a significant increase in chronic persistent hepatitis compared to the controls as did the levels of all 3 immunoglobulins in chronic aggressive hepatitis and in cirrhosis of the liver. The increase in IgG was particularly marked in chronic aggressive hepatitis. The serum ceruloplasmin and α_2-macroglobulin levels were increased in relation to the extent of the inflammatory process involving the hepatic stroma. In contrast, β_1-C-globulin and transferrin were not significantly affected. HB_SAg and humoral antibodies were seen most frequently in chronic aggressive hepatitis. These results suggest the existence of a definite relationship between the persistence of HB_SAg and the production of chronic parenchymal injury in the liver. They also support the claim that the immune system is affected by chronic hepatitis.

3486 REMISSION OF ACTIVE CHRONIC HEPATITIS AFTER TREATMENT WITH CYCLOPHOSPHAMIDE AND PREDNISOLONE. REPORT OF FOUR CASES. *(E.)* Pengelly, C. D. R.; Jennings, R. C. (Gen. Hosp., Altrincham, Cheshire, England). *Practitioner* 214(1280):233-242, 1975.

Four case reports are presented in which four patients with chronic active hepatitis experienced remission following therapy with prednisolone and cyclophosphamide. The patients, aged 42-74 yr, presented with malaise, dyspepsia, abdominal tenderness and jaundice. All had elevated serum globulins and raised serum aminotransferase levels, and some evidence of disturbed autoimmune mechanisms. Liver biopsy revealed focal necrosis, fibrous bands and plasma cell infiltration. Treatment with cyclophosphamide (25-100 mg/day) and prednisolone (10-20 mg/day) resulted in total remission of disease in three patients with normalization of liver function tests and histology which has persisted for 20-58 months. The fourth patient has progressively improved over a 5 month period. Except for a transcient mild thrombocytopenia in two patients, there were no significant side effects of therapy. It is concluded that combined cyclophosphamide-prednisolone therapy is satisfactory for the treatment of chronic active hepatitis and is probably superior to other modes of therapy because of its ability to suppress autoimmune mechanisms.

3487 INFLUENCE OF AZATHIOPRINE ON HEPATIC RESERVE IN CHRONIC ACTIVE LIVER DISEASE. *(E.)* Rikkers, L.; Sherlock, S. (R. Free Hosp., London, England). *Gut* 16(3):214-219, 1975.

An investigation was conducted to determine if hepatic indocyanine green (ICG) excretion in patients with chronic active liver disease follows saturation kinetics, allowing calculation of the maximal rate of ICG removal (R_{max}), and to assess the role of azathioprine in the management of patients by evaluating the influence of this drug on R_{max}. Following the initial ICG analysis, azathioprine (75 mg/day) was administered to 14 patients (eight men and six women, aged 13-69 yr) with chronic active liver disease. Prednisolone therapy was continued in five patients (10 mg/day). Two weeks later a second ICG study was performed in 11 patients. The hepatic removal in individual ICG doses was exponential in most cases, with the correlation coefficient of the plasma disappearance rate plot exceeding 0.995 in 66 of 82 dose studies (81%). The general conformity of the data to Michaelis-Menten kinetics was confirmed. Initial values for R_{max} and K_m for all patients were 0.47 mg/kg/min and 6.54 mg/kg resp. R_{max} was significantly higher in untreated patients than for those on maintenance corticosteroids. Following 2 weeks of treatment with azathioprine, no improvement was detected in R_{max} in previously untreated patients, those on maintenance prednisolone, or both groups combined. Thus it appears that at least over the short term, azathioprine has no beneficial influence on the liver's reserve for ICG removal in these patients; in fact, in isolated cases this drug may be detrimental. The results of the study indicate that hepatic removal of incremental doses of ICG is consistent with Michaelis-Menten kinetics in most patients with chronic active liver disease, thus providing a means of estimating a maximal removal fate for this dye.

3488 STUDY OF ANTIBODIES FOR ANTILYMPHOCYTE, Au/SH, AND LIVER TISSUE ANTIGENS IN CHRONIC LIVER DISEASE. *(Hun.)* Dobias, G.; Szecsey, G.; Hollos, I.; Barnabas, L.; Kendrey, G. (Dep. Exp. Lab. Anal., Inst Postgrad. Phys., Budapest, Hungary). *Orv. Hetil.* 115(19):1093-1097, 1974.

Lymphocyte cytotoxins, as well as Au/SH and liver tissue antigen antibodies were studied in patients with chronic aggressive hepatitis, chronic persistent hepatitis, and cirrhotic hepatitis. Lymphocyte cytotoxins reacting with allogenic lymphocytes at 15 C were found in serum samples from 30 out of 50 patients. Antibodies reacting with autologous lymphocytes at 15 C were found in 6 out of 50 patients, including two each with chronic aggressive hepatitis, chronic persistent hepatitis, and cirrhotic hepatitis. Lymphocyte cytotoxins reacting with autologous lymphocytes at 37 C were detected in four patients (one case of chronic aggressive hepatitis, two cases of chronic persistent hepatitis, and one case of cirrhotic hepatitis) with below-normal lymphocyte counts, including three cases of leukopenia. Antibodies reacting with untreated Au/SH antigen were found in 14 out of 132 cases, while antibodies reacting with Tween-80-treated Au/SH antigen were found in 38 cases. The incidence of antibodies reacting with liver tissue antigens (MF, SF) was highest in sera from patients with chronic aggressive hepatitis. A significant relationship was established between the presence of Au/SH antigen and liver tissue antigen antibodies in all types of liver diseases studied. Antigen-antibody complexes and several antibodies with different degrees of specificity were found simultaneously in chronic aggressive hepatitis.

3489 CHRONIC HEPATITIS AND AUTOANTIBODIES IN OXYPHENISATIN USE. *(Dut.)* Niermeyer, P.; Gips, C. H.; Trommel, J. (Acad. Hosp., Groningen, Netherlands). *Tidjschr. Gastroenterol.* 17(2):119-120, 1974.

3490 THE HISTOCHEMISTRY OF ARYLSULFATASE IN CHRONIC LIVER DISEASE. *(Fr.)* Bordeianu, A.; Nicolaescu, T.; Stoiculescu, P.; Bittman, E. (D. Danielopolu Inst. Norm. Pathol. Physiol., Bucharest, Rumania). *Rev. Roum. Physiol.* 11(1):35-40, 1974.

3491 SOME SERUM PROTEINS IN POSTHEPATITIC SYNDROMES: EVALUATION OF THE POSSIBLE BIOLOGICAL AND DIAGNOSTIC SIGNIFICANCE OF CHANGES IN THEM. *(It.)* Marasini, B.; Stabilini, R.; Del Ninno, E.; Pontello, M.; Agostoni, A. (Inst. Spec. Med. Pathol., Univ. Milan, Italy). *Fegato* 19(3):571-584, 1973.

3492 CLINICAL AND BIOPSY FINDINGS IN AUSTRALIA ANTIGEN-POSITIVE BLOOD DONORS. *(Ger.)* Schlicht, I.; Hasse, W.; Alexander, M.; Weisse, W.; Sucker, U. (Med. Clin. Polyclin., Free Univ. Berlin, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:974-977, 1973.

3493 THE PATHOGENESIS AND CORRECTION OF HEPATIC BLOOD FLOW IN CHRONIC HEPATITIS AND CIRRHOSIS. *(Rus.)* Khanin, M. N.; Mankus, T. G. (Tashkent Med. Inst., USSR). *Patol. Fiziol. Eksp. Ter.* (6):6-11, 1973.

3494 CRITICAL LONG-TERM STUDY OF THE ADMINISTRATION OF ESSENTIAL PHOSPHOLIPIDS TO PATIENTS WITH CHRONIC LIVER DISEASE. *(Ger.)* Hirsch, W.; Freude, J. (Schwerpunkt Hosp., Traunstein/Upper Bavaria, Germany). *Therapiewoche* 24(38):4176,4179-4180, 1974.

3495 IMMUNOSUPPRESSIVE THERAPY IN PROGRESSIVE HEPATITIS. *(It.)* Fiaccadori, F.; Camilloni, R.; Canaletti, R. (Reg. Hosp., Parma, Italy). *Fegato* 19(3):585-595, 1973.

3496 MARGINAL LIVER RESECTION IN CHRONIC HEPATITIS AND CIRRHOSIS. *(Por.)* Ardamatskaya, A. N. (Sao Lucas Sanit., Sao Paulo, Brazil). *Bol. Sanatorio Sao Lucas* 35(6):121-124, 1974.

3497 ACTIVE CHRONIC HEPATITIS IN SRI LANKA PATIENTS. *(E.)* Nagaratnam, N.; DeSilva, D. P. K. M.; DeSilva, S. P. (Gov. Hosp., Colombo, Sri Lanka). *Digestion* 11(3/4):249-256, 1974.

3498 Q FEVER ENDOCARDITIS AND CHRONIC LIVER INVOLVEMENT. Delaney, J. C.; Roberts, H. L. (David Lewis North. Hosp., Liverpool, England). *Practitioner* 214(1280):243-245, 1975.

3499 THE ENZYMATIC DIFFERENTIATION OF VARIOUS CLINICAL FORMS OF CHRONIC HEPATITIS. *(Ger.)* Maier, K. P.; Volk, B.; Talke, H.; Gerok, W. (Med. Clin., Univ. Freiburg/Breisgau, Germany). *Therapiewoche* 24(50):5986, 1974.

3500 COEXISTENCE OF RAYNAUD'S PHENOMENON AND CHRONIC ACTIVE HEPATITIS WITH HEPATITIS B ANTIGEN. *(E.)* Kim, W. K.; Koff, R. S. (Boston VA Hosp., Mass.). *Digestion* 11(1/2):152-156, 1974.

See also, 2664, 2875, 2923, 2930, 2960, 3441, 3445, 3454, 3528, 3536, 3549.

LIVER AND BILIARY TRACT

Alcoholic Liver Disease

3501 LIVER BLOOD FLOW IN ALCOHOLIC CIRRHOSIS. *(Fr.)* Huet, P. M.; Marleau, D.; Lavoie, P.; Viallet, A. (St. Luc Hosp., Montreal, Canada). *Union Med. Can.* 103(12):2069-2077, 1974.

The severity of portal hypertension in cirrhosis is best evaluated by measuring the portal-hepatic gradient. This gradient ranged from 7 to 26 mm Hg in 54 patients with alcoholic cirrhosis. The portal-hepatic gradient was greater than 12 mm Hg in all patients who had bleeding esophageal varices diagnosed at emergency endoscopy. The varices were 3-4 mm in diameter or larger in all patients with bleeding varices. These results suggest that cirrhotics with portal-hepatic gradients greater than 12 mm Hg are potential bleeders. A portal-hepatic gradient less than 12 mm Hg and small varices suggest that varices are not the cause of upper gastrointestinal bleeding in patients with alcoholic cirrhosis. After combined catheterization of subhepatic umbilical and portal veins and the upper mesenteric artery, ^{51}Cr-labeled RBC were injected into the upper mesenteric artery and dilution curves were obtained for 18 cirrhotics with severe portal hypertension. The portal fraction of total liver blood flow ranged from 30 to 100% (mean 67.3%). There was no correlation between the portal fraction of total liver blood flow and indocyanine green (ICG) clearance, the portal-hepatic gradient, or total liver blood flow. These results suggest that this technique could be used to select candidates for shunt surgery after a critical value for portal blood flow has been established. By using the same catheterization technique, it was demonstrated that ^{125}I-labeled albumin microaggregate uptake ranged from 5.2 to 100% (mean 48.8%) and ICG uptake from 3.9 to 54.0% (mean 22.4%) in 10 patients with cirrhosis. In contrast, normal values were measured in 4 patients with idiopathic portal hypertension. A highly significant correlation between ^{125}I-labeled albumin microaggregate and ICG uptake was found in these 14 patients, as was a highly significant correlation between ^{125}I-labeled albumin aggregate uptake and relative ICG clearance. This suggests that the decrease in these substances is secondary to changes in hepatic microcirculation. The decrease in ^{125}I-labeled albumin uptake which occurs during cirrhosis might result from the fact that some portal blood does not perfuse Kupffer cells because of portohepatic shunts. Thus, ^{125}I-labeled albumin microaggregate uptake might also be used to estimate functional portal flow in cirrhotics.

3502 IDENTIFICATION OF ACTIN-LIKE PROTEINS IN ALCOHOLIC HYALINE BY IMMUNOFLUORESCENCE. *(E.)* Nenci, I. (Inst. Pathol. Anat, Univ. Ferrara, Italy). *Lab. Invest.* 32(2):257-260, 1975.

Alcoholic liver disease Mallory bodies were tested for the presence of actin by means of antiactin antibodies. Liver biopsies were taken from 5 chronic alcoholic liver disease patients and 3 control nonalcoholic patients. Sera of patients with chronic aggressive hepatitis were tested for antiactin antibodies by indirect immunofluorescence. None of the sera contained antimitochondrial, antinuclear, or antireticulin autoantibodies. Cryostat sections of the liver specimens were treated with a 1:50 dilution of the antiactin antibody serum and reacted with fluorescein isothiocyanate conjugated goat anti-human immunoglobulin antiserum. Readings were made by immunofluorescence microscope. Control specimens were treated either with antiactin antibody serum as above, innoculated with normal human sera lacking smooth muscle autoantibodies, or incubated with goat anti-human immunoglobulin antiserum after application of the antiactin antibody sera. All of the antiactin antibody-containing sera stained the Mallory bodies by indirect immunofluorescence. The fluorescent appearance was consistent with the light microscope appearance. Strongest staining was seen in the hepatocytes. In addition to the Mallory bodies, stain was picked up in a polygonal pattern near the cell membrane in some cells. Normal sera did not show any staining effect on either alcoholic or control specimens. The control specimens occasionally showed a weak polygonal staining of the cell membrane with the antiactin antibody sera. No fluorescence was observed when unlabeled antiserum was used before fluorescein-conjugated antiserum. It is concluded that Mallory bodies in the liver cells of alcoholic patients contain actin-like immunoreactive proteins, and may represent a quantitative alteration of contractile proteins resulting from the disease process.

3503 HYPOGONADISM IN ALCOHOLIC LIVER DISEASE: EVIDENCE FOR A DOUBLE DEFECT. *(E.)* Van Thiel, D. H.; Lester, R.; Sherins, R. J. (Dep. Med., Univ. Pittsburgh, Pa.). *Gastroenterology* 67(6):1188-1199, 1974.

Hypothalamic-pituitary-gonadal function was evaluated in 40 men with a wide spectrum of alcoholic liver disease to identify an anatomic location and biochemical mechanism responsible for observed hypogonadism and feminization. Basal plasma concentrations of follicle-stimulating hormones, luteinizing hormone, estradiol, and testosterone were determined. Hormonal responses to provocative clomiphene and chorionic gonadotropin stimulation were evaluated. Sex steroid-binding globulin capacity was determined to evaluate plasma concentrations of free sex steroid. No correlation between any specific biochemical assessment of the severity of liver disease and the degree of hormonal derangement was noted. However, mean plasma testosterone levels were lower in association with more severe derangements of hepatic histology. Both follicle-stimulating hormone and luteinizing hormone concentrations ranged from normal to moderately elevated with means values (19.8 and 17.2, resp.) statistically elevated when compared to normal means (follicle-stimulating hormone, 11.6 and luteinizing hormone, 8.8). Total plasma estradiol levels were normal or reduced, but the mean (35.6) did not differ from normal. In contrast, plasma testosterone was reduced in half of the men to a mean of 313, which differed significantly from the normal mean of 519. Further magnifying the reduction in testosterone, there was an 8-fold elevation of sex steroid-binding globulin (4.325 compared to normal values of 0.521). Clomiphene response was markedly diminished in the majority with 2/3 failing to produce a 50% increase of either gonadotropin. Similarly, more than 1/3 failed to show a 50% increase in plasma testosterone after exogenous chorionic gonadotropin. Thus, both primary gonadal failure and hypothalmic-pituatary suppression are demonstrable in men with alchoholic liver disease. These abnormalities may result from the ingestion of alchohol. However, function rather than from alcohol ingestion *per se* must not be overlooked. Gonadal atrophy and hypothalmic-pituitary suppression in alcoholic liver disease may result from defective hepatic regulation of estrogenicity. In the face of hepatic damage, nonsteroidal estrogens may be insufficiently metabolized or excreted by the liver, excessive concentrations may accumulate in plasma, and this accumulation may result in target organ stimulation. The possibility that feminization of patients with liver disease results from the accumulation of exogenous rather than endogenous estrogen should be examined. Similarly, the finding of the lowest plasma gonadotropin values and the most severe gonadal failure in those men with the most advanced liver disease may result from increased retention of nonsteroidal estrogen.

3504 THE EFFECT OF CIRRHOSIS ON THE DISPOSITION AND ELIMINATION OF CLINDAMYCIN. *(E.)*

Avant, G. R.; Schenker, S.; Alford, R. H. (Vanderbilt Med. Sch., Nashville, Tenn.). *Am. J. Dig. Dis.* 20(3):223-230, 1975.

The effect of liver disease in patients and of experimental hepatic damage in rats on the disposition and elimination of clindamycin was investigated. Seven patients, average age 41.57 yr, were studied, of whom four had ascites, five had esophageal varices and three had signs of hepatic encephalopthy on earlier occasions. One patient had received 6 capsules of Dyazide (50 mg triamterene and 25 mg hydrochlorothiazide each) during the 3 days prior to the study. The results showed significant impairment of clindamycin elimination in the patients. However, the prolongation of the drug half-life was only modest about 1 hr, 31% over the normal value of 3.42 hr. The half-life in the cirrhotics correlated positively with total serum bilirubin and with SGOT, but not with other liver function tests. It is suggested, assuming higher values for these two tests imply increasing severity of liver disease, that in patients with more extensive hepatic dysfunction greater impairment of clindamycin elimination would be found. Pharmacokinetic analysis of these data suggest that the prolongation of clindamyacin half-life in cirrhosis resulted from decreased drug clearance, not from increases in the volume of distribution. The altered drug clearance in cirrhosis may represent impaired hepatic elimination. Clindamycin serum protein binding in both control and cirrhotic patients was of the order of 79%. The lack of significant decrease of serum binding of clindamycin in cirrhosis is consistent with the absence of a significant increase in the volume of distribution of the drug in this group. Studies were also carried out in Sprague-Dawley rats with hepatic dysfunction caused by CCl_4 pretreatment (0.6 ml/kg) or bile duct ligation. The prolongation of clindamycin half-life obtained with acute hepatic injury of 24 hr duration was highly significant. The data suggest that acute hepatic injury may cause major changes in clindamycin elimination. In conclusion, there was a statistically significant but only modest impairment of clindamycin elimination in this group of alcoholic cirrhosis patients. Animal data suggested that significant changes also could occur with acute hepatic dysfunction and cholestasis.

3505 INCREASED RATE OF ALCOHOL REMOVAL FROM BLOOD WITH ORAL FRUCTOSE AND SUCROSE. *(E.)*

Soterakis, J.; Iber, F. L. (Tufts Univ. Sch. Med., Boston, Mass.). *Am. J. Clin. Nutr.* 28(3):254-257, 1975.

The effect of oral glucose, fructose, and sucrose on the disappearance rate for i.v. administered alcohol was studied in 8 abstinent alcoholic subjects (all males, aged 25-53 yr). The 3 sugars were ingested on separate days in random sequence. After an overnight fast, subjects drank a lemon-flavored solution of glucose (2 g/kg), fructose (2 g/kg), or sucrose (4 g/kg). Alcohol levels were determined at hourly intervals. During ingestion of the sugars, the mean rates of alcohol disappearance were: 19 mg/100ml/hr for glucose; 23.9 mg/100 ml/hr for sucrose, and 25.4 mg/100 ml/hr for fructose. Compared with glucose, both fructose and sucrose increased the rate of removal of alcohol from the blood. Blood fructose levels were similar after the oral dose of fructose or sucrose. Sucrose is more readily available and cheaper to use than fructose and can be used instead of fructose to accelerate alcohol metabolism. Minimal complications were experienced from ingestion of fructose and sucrose. The time necessary to lower blood alcohol levels from 250 mg/100 ml to 40 mg/100 ml should be 3-4 hr shorter with p.o. fructose or sucrose than with glucose. It is noted that blood disappearance of alcohol is not synonymous with sobering or becoming mentally clear.

3506 THE IMPORTANCE OF LIVER BIOPSIES IN THE DIAGNOSIS OF CLINICALLY MANIFEST ALCOHOLIC LIVER DISEASE.

(Ger.) Stotzner, H. (Carl Gustav Carus Med. Acad., Dresden, Germany). *Zentralbl. Alg. Pathol.* 118(4):367-374, 1974.

To determine whether alcoholic liver damage can be diagnosed by histological changes alone, 29 histological features were studied in liver biopsies from 43 patients (34 men and nine women, aged 31-69 yr, mean age 45.9 yr). Of these patients, 33 had consumed between 15 and 450 g/day of alcohol for 4-22 yr (mean 10.2 yr); no accurate information was available on the drinking habits of the remaining 10 patients. Before the biopsies were taken, none of the patients had been given any drugs known to cause liver damage. None of these patients had any clinical evidence of viral hepatitis or hepatobiliary disease. Except for alcoholic hyaline and alcoholic hepatitis, no significant correlations were found between any of the parameters studied. However, five to eight of the following parameters were present in 40 of the 43 patients (93%): cholestasis, giant mitochondria, alcoholic hyaline, focally increased basophilia in the cytoplasm of liver cells, cytoplasmic lakes in the hepatic epithelium, steatosis, siderosis, and fibrosis. In liver biopsies from unselected patients, five or more of the above criteria were found in only two patients who had no history of alcohol consumption. However, both of these patients had been given drugs known to cause liver damage before the biopsies were taken. In the 43 patients whose biopsies were studied in detail, 42 had inflammatory changes in the liver. However, this inflammation fulfilled the criteria for alcoholic hepatitis in only 17 cases. Only 10 of these patients (26%) had evidence of portal hypertension, so that a diagnosis was established in most cases before irreparable liver damage had occurred.

3507 INDUCTION OF DRUG-METABOLIZING ENZYMES IN CHRONIC ALCOHOLICS.

(Ger.) Gundert-Remy, U.; Marquardt, R.; Andritsch, F.; Weber, E. (Med. Clin., Heidelberg, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:907-908, 1973.

To determine whether alcohol induces microsomal, drug-metabolizing enzymes in the livers of chronic alcoholics, the half-lives of antipyrine and tolbutamide were measured in plasma from patients hospitalized for chronic alcoholism before and 4 weeks after abstention from alcohol and from nonalcoholic controls. Antipyrine (15 mg/kg) was administered to five alcoholics and five controls, and tolbutamide, to two alcoholics and six controls. None of the alcoholics were given any drugs for at least 3 weeks before the second test. The mean half-lives of antipyrine were lower in alcoholics than in nonalcoholic controls, suggesting that alcohol does induce drug-metabolizing enzymes in the livers of these patients. However, when the two tests were compared for individual alcoholics, half-lives increased in only two of five patients. Changes in the half-lives of antipyrine were of the same order of magnitude in alcoholics (-0.6 hr) and controls (-0.4 hr). Similar results were obtained with tolbutamide. It is concluded that alcohol does not induce drug-metabolizing enzymes in the livers of chronic alcoholics.

3508 GLYCOGENOLYSIS AND GLUCONEOGENESIS IN HUMAN LIVER AS INFLUENCED BY ETHANOL.

(Ger.) Dietze, G.; Wicklmayr, M.; Grunst, J.; Hepp, K. D.; Braun, S.; Mehnert, H. (Schwabing Hosp., Munich, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:911-914, 1973.

Catheters were inserted into the hepatic veins and needles into the femoral arteries of 14 normal subjects who had fasted for 14 hr. After a 30 min basal period, alcohol was infused into the cubital vein at a rate of 15 g/5 min which was later decreased to 0.2 g/min. Blood samples were taken before alcohol infusion and at 10 min intervals for 1 hr thereafter to determine insulin, glucose, lactate, pyruvate, β-hydroxybutyrate, acetoacetic acid, glycerol, and amino acids. Similar determinations were performed on six controls who received i.v. infusions of physiological saline. Liver blood flow was measured throughout with an ^{133}Xe inhalation technique. Within 10 min after alcohol infusions were begun, ethanol concentrations in the femoral artery and hepatic vein reached a steady state at a concentration of 9 mM, and glucose production increased by 60%. After 50 min, glucose production decreased to values which were lower than those in the controls. Glycerol utilization increased significantly after 30 min and reached initial values after 50 min, while alanine utilization increased immediately after alcohol infusions were begun and remained elevated for about 30 min; a significant decrease occurred 20 min later. The uptake of lactate ceased entirely during administration of alcohol, and lactate production began shortly after alcohol infusions began. By assuming that lactate, alanine, and glycerol are used only to produce glucose and are converted into glucose in stochiometric proportions, 40% of the glucose produced in the liver under basal conditions results from gluconeogenesis and 60% from glycogenolysis. When alcohol is infused, gluconeogenesis decreases by 75% and remains essentially unchanged throughout the observation period. Thus, the increase in glucose production induced by ethanol can be attributed to a large increase in the rate of glycogenolysis.

3509 ACQUIRED DYSERYTHROPOIETIC ANEMIA IN CHRONIC LIVER DISEASE (ALCOHOLIC CIRRHOSIS). *(Ger.)* Riedler, G. F.; Schmid, M. (Waid Munic. Hosp., Zurich, Switzerland). *Schweiz. Med. Wschr.* 104(39):1393, 1974.

Hematological test findings in three patients with serious alcoholic liver cirrhosis are presented with respect to the pathogenesis of acquired dyserythropoietic anemia. Typical macrocytic anemia with target cells and stomatocytes, and increased rate of erythropoiesis with normal sideroblasts were detected in all three patients. The first patient (aged 44 yr, male) additionally showed acquired, refractory anemia, bizarre karyoclasis, polynuclear erythroblasts with filamentous interchromatin bridges, and reduced reticulocyte count in the bone marrow. ^{59}Fe Incorporation was 18%, and the calculated ineffective erythropoiesis was 63.37 mg/day against a normal range of 6-26 mg/day. The second patient (aged 61 yr, male) showed a reduced variety of karyoclases, and few polynuclear erythroblasts. The iron incorporation amounted to 51%. Increased erythropoiesis and normal iron incorporation were found in a third, 59-yr-old female patient. The PAS, ham and sucrose tests were negative in all patients. The findings indicate acquired dyserythropoietic anemia in the first patient, and the comparison with the other patients suggests a smooth transition from pure ineffective erythropoiesis to dyserythropoietic anemia in patients with serious chronic liver disease.

3510 PRELIMINARY OBSERVATION OF d-PENICILLAMINE THERAPY IN ACUTE ALCOHOLIC LIVER DISEASE. *(E.)* Resnick, R. H.; Biotnott, J.; Iber, F. L.; Makopour, H.; Cerda, J. J. (Lemuel Shattuck Hosp., Boston, Mass.). *Digestion* 11(3/4):257-265, 1974.

The effect of penicillamine on the mortality rate, hepatic dysfunction, and histopathology of acute alcoholic liver disease was studied in a prospective controlled trial. Hospitalized patients with this condition (19) were given penicillamine (250 mg 4 times a day) p.o. for 8 weeks, and 21 similar patients were given a placebo for the same period of time. The penicillamine and placebo groups did not differ significantly in terms of mortality rate or longevity; in each group, the deaths were due to hepatic failure characterized by increasing jaundice and ascites. Although total bilirubin and SGOT values improved significantly within each group during the study, the two groups did not differ significantly from each other in terms of hepatic function. However, compared with the placebo group, the penicillamine group showed a greater reduction in total and active fibrosis and cellular injury during the 8-week treatment program. Determinations of histologic diagnosis also suggested improvement consequent to penicillamine treatment, although the differences between the penicillamine and placebo groups in this respect were not significant. Since penicillamine failed to improve survival rates or liver function parameters in these patient, the routine use of this drug in the management of alcoholic hepatitis cannot be justified. However, this agent may find ultimate use in the treatment of chronic hepatic disorders associated with fibrogenesis.

3511 EARLY DIAGNOSIS OF FIBROUS LESIONS OF THE LIVER IN CHRONIC ALCOHOLICS. *(Fr.)* Berthet, P.; Bel, A.; Girard, M. (no affil.). *J. Med. Lyon* 55(1271):821-836, 1974.

3512 INFLAMMATORY STEATONECROSIS OF THE ALCOHOLIC LIVER (ACUTE ALCOHOLIC HEPATITIS: FOUR CASES). *(Fr.)* Tolot, F.; Girard, D.; Pelletier, M.; Bernier, E. (Jules Courmont Hosp., Lyon, France). *J. Med. Lyon* 55(1266):421-431, 1974.

3513 THROMBOPENIA IN THE ALCOHOLIC. *(Fr.)* Terrasse, J.; Moinade, S.; Decombas, J. P. Y. (Med. Clin. B., Clermont-Ferrand, France). *Rev. Fr. Gastroenterol.* (98):5-11, 14, 17-21, 24, 28, 1974.

3514 ISOLATION OF MALLORY BODIES BY POLYMER TWO-PHASE SYSTEM. *(E.)* Harwood, T. R.; Yokoo, H. (VA Res. Hosp., Chicago, Ill.). *Fed. Proc.* 34(3):843, 1975.

3515 DIFFERENCES IN ADIPOSE TISSUE METABOLIC ACTIVITIES BETWEEN PATIENTS WITH ALCOHOL- AND CARBOHYDRATE- INDUCED HYPERLIPEMIA. *(E.)* Kuo, P. T.; Fan, W. C.; Hayase, K.; Thyrum, E. M.; Kostis, J. B. (Rutgers Med. Sch., Piscataway, N.J.). *Am. J. Clin. Nutr.* 28(4):424, 1975.

3516 PLASMA AMINO ACIDS IN ALCOHOLIC LIVER INJURY: CONTRAST WITH PROTEIN MALNUTRITION. *(E.)* Shaw, S.; Lieber, C. S. (Bronx VA Hosp., N.Y.). *Am. J. Clin. Nutr.* 28(4):423, 1975.

3517 IMPAIRED UTILIZATION BY CHRONIC ALCOHOLICS OF YEAST AS A SOURCE OF FOLIATES. *(E.)* Frank, O.; Zetterman, R.; Rajan, K. S.; Baker, H. (New Jersey Med. Sch., Newark). *Am. J. Clin. Nutr.* 28(4):419, 1975.

3518 ELECTROLYTE IMBALANCE IN ALCOHOLIC LIVER DISEASE. *(E.)* Sturner, W. Q.; Coe, J. I. (Univ. Texas Southwest. Med. Sch., Dallas). *J. Forensic Sci.* 18(4):355-360, 1973.

See also, 2875, 3521.

LIVER AND BILIARY TRACT

Cirrhosis

3519 THE PREDICTION OF THE OUTCOME OF PORTACAVEL [SIC!] SHUNT USING BROMSULPHTHALEIN (BSP): A RETROSPECTIVE ASPECT. *(E.)* Turner, J.; Cuschieri, A.; Shields, R. (Dept. Surg., Univ. Liverpool, England). *Br. J. Surg.* 61(10):828-831, 1974.

The use of compartmental BSP kinetics to predict the outcome of portacaval shunt operations was investigated in 17 patients who underwent elective portacaval shunt. The indication for operation in each case was previous hemorrhage from esophageal varices. In all patients the portal hypertension was the result of hepatic cirrhosis. The survival range after operation was 2 weeks to 14 yr. BSP (3-4 mg/kg) was injected i.v. after an overnight fast. Venous blood was obtained from the other arm through a wide bore cannula, initially at 2-min intervals, later at 5-min intervals, and finally at 10-min intervals over a period of 80 min. In each sample the plasma concentration was determined spectrophotometrically. The equivalent liver volume is given by aV/b, where V is the plasma volume, a is the rate constant for the movement of BSP from plasma to liver, and b, the rate constant for the movement of BSP from liver to plasma (a and b are derived from the plasma disappearance curve of BSP when plotted on semilogarithmic paper). The equivalent liver volume is an expression of the storage capacity of the liver for BSP and is the volume of plasma which would contain the same amount of BSP as the liver. The mean value for equivalent liver volume in the 17 patients studied was 0.59 liter/kg. In those in whom the clinical outcome of portacaval shunt was regarded as good (six patients) the preoperative equivalent liver volume in every case but one was more than 0.75 liter/kg, whereas among those in whom the results were poor, the equivalent liver volume was less than o.75 liter/kg. It appears that a patient with an equivalent liver volume of less than 0.5 liter/kg before operation had a high risk of dying or developing chronic hepatic failure if he survived the operation. Although these results are from a retrospective study of a small number of patients, they suggest that the equivalent liver volume may be of considerable predictive value for shunt operation.

3520 INTRACISTERNAL HYALINE IN HUMAN BIOPSIES. *(Ger.)* Pfeifer, U.; Klinge, O. (Pathol. Inst., Univ. Wurzburg, Germany). *Verh. Dtsch. Ges. Pathol.* 57:438, 1973.

Unusual cytoplasmic hyaline inclusions were found in the livers of two patients with cirrhosis and in one with an unclassifiable form of chronic progressive parenchymal damage. In one cirrhotic they consisted of many spheres, up to 15 μ in diameter, which stained positively with PAS reagent and were resistant to diastase. In the second cirrhotic, the inclusions were irregular in form and PAS-negative. PAS-negative hyaline inclusions occurred primarily at the periphery of the lobules and measured about 7 μ in diameter in the third case. In all three cases, Laqueur's acid fuchsin stain was negative. Electron microscopy showed that some of the inclusions were surrounded by a membrane, studded in places with ribosomes and bound directly to cisternae in the rough endoplasmic reticulum. Lipid droplets were present in the inclusions in the first two cases. These findings suggest that there is a disorder in the transport of protein in these hyaline inclusions.

3521 THE ASSOCIATION OF SYPHILIS WITH CIRRHOSIS: THE ROLE OF ALCOHOL AND SERUM HEPATITIS. *(E.)* Sadikali, F. (Makerere Univ. Med. Sch., Kampala, Uganda). *Postgrad. Med. J.* 51(592):69-73, 1975.

The role of syphilis and alcohol was investigated in a prospective study of 80 patients with cirrhosis of the liver in Uganda. Results were correlated with the histological type of cirrhosis, and serological tests for hepatitis B antigen (HB Ag). Eighteen (22.5%) patients with histologically-proven cirrhosis had positive seriology for syphilis (VDRL and TPI). A high incidence of alcoholism (80%) and syphilis (60%) was found in patients with micronodular cirrhosis who were all negative for HB Ag. By contrast, HB Ag was detected in 37% of patients with macronodular cirrhosis who had a much smaller incidence of syphilis and alcoholism. Although chronic infection with hepatitis B virus related to HB Ag appears to be an important factor in the pathogenesis of cirrhosis in at least 30% of cases, infection acquired during past treatment for syphilis is not an important cause of the association of syphilis with cirrhosis in this population. Subdivision of patients with cirrhosis into those with and those without a history of severe alcohol abuse showed that the difference between the incidence of syphilis in the two groups is statistically significant. However, evidence of syphilis in association with non-alcoholic as well as alcoholic cirrhosis in this and other previously reported series suggests that the association between the two diseases cannot be entirely explained through the common factor of alcoholism, and other factors may also be responsible.

3522 PRIMARY BILIARY CIRRHOSIS IN BROTHERS. *(E.)* Bown, R.; Clark, M. L.; Doniach, D. (St. Bartholomew's Hosp., London, England). *Postgrad. Med. J.* 51(592):110-115, 1975.

Case histories of two brothers with classical primary biliary cirrhosis are presented. Both patients, who presented at age 58, developed abnormal liver function tests, jaundice, hepatomegaly and portal hypertension which progressed eventually to coma and death. Both had antimitochondrial antibodies while one also exhibited smooth muscle antibodies. One became Australia antigen-positive terminally. Liver biopsies revealed advanced primary biliary cirrhosis. Both patients also developed an associated keratoconjunctivitis sicca. In one, renal tubular acidosis and ruptured esophageal varices occurred following lactulose therapy. Screening of the family revealed three relatives with overt thyroid disease, one sister with a high anti-thyroid antibody titer, and several other members with autoimmune diseases or auto-antibodies. This representes the first known report of primary biliary cirrhosis in brothers.

3523 PHENOBARBITAL EFFECTS IN CHOLESTATIC LIVER DISEASE.

(E.) Bloomer, J. R.; Boyer, J. L. (Yale Univ. Sch. Med., New Haven, Conn.). *Ann. Intern. Med.* 82(3):1-5, 1975.

The effects of short-term phenobarbital administration on liver function and disease progression were studied in seven patients with primary biliary cirrhosis, two with sclerosing cholangitis, three with intrahepatic biliary hypoplasia and three with cholestatic hepatitis. Phenobarbital was given p.o. 120-250 mg/day for 1-5 months. Except for those patients with cholestatic hepatitis, total serum bilirubin declined during therapy from a mean of 7.0 mg% to 3.6 mg% with concomitant relief of pruritus. Some patients also showed reduced serum bile acid concentrations which, however, did not correlate with the extent of decrease in bilirubin. The mean serum cholate:chenodeoxycholate ratio decreased from 2.1 to 1.7, both substances declining during therapy. Although some patients showed slight improvement in BSP excretion and hepatic uptake of ^{131}I-rose benegal, the changes were not significant ($P > 0.10$). Serum cholesterol concentrations and other hepatic function tests also were not significantly changed except for alkaline phosphatase which rose in 12 of 15 patients. It is concluded that short-term phenobarbital administration is helpful in selected patients with intrahepatic cholestasis.

3524 RELATION BETWEEN MORPHOLOGY AND FUNCTION IN PRETERMINAL DIGITAL CIRCULATION IN CIRRHOSIS. II.

(It.) Andreuzzi, P.; Curri, S. B.; Redaelli, T.; Cantoni, L. (Maggiore Ca' Granda Hosp.; Milan, Italy). *Minerva Med.* 65(40):2287-2295, 1974.

The relation between morphology and function in preterminal digital circulation was studied in 16 patients with cirrhosis of the liver by oscillographic, plethysmographic, and rheographic methods. All patients showed serious, bioptically demonstrated changes in the arteriovenous anastomoses. Abnormal plethysmograms in 10 cases, considerable reduction of the pulse volume with reduced or suppressed dicrotism, and reduced arterial flow rate following the venous congestion test in 5 cases were observed. The marked vasomotor hypertonia was dispelled by indirect heating. The findings indicate the morphological and functional involvement of the digital derivative circulation in liver cirrhosis. While the changes observed are similar to those found in physiological senility and during the initial stages of peripheral vascular diseases, the arteriosclerotic and atheromatous phenomena are less severe in cirrhosis.

3525 HYPERNATREMIA FOLLOWING GASTROINTESTINAL BLEEDING IN CIRRHOSIS WITH ASCITES.

(E.) Rodes, J.; Arroyo, V.; Bordas, J. M.; Bruguera, M. (Clin. Prov. Hosp., Univ. Barcelona, Spain). *Am. J. Dig. Dis.* 20(2):127-133, 1975.

Plasma hypernatremia and hyperosmolality produced by osmotic diuresis following gastrointestinal bleeding, occurred 6 times in 3 patients. In each case the patient presented with cirrhosis and ascites. The relationship of the diuresis, and increase in blood urea concentration and excretion, and the close temporal relationship between the episodes of diuresis and the gastrointestinal bleeding suggested that the diuresis was due to increase in blood urea from intestinal absorption of blood. Hypernatremia results in cirrhosis and ascites because of low natriuresis due to low distal sodium resorption probably resulting from hyperaldosteronism. It is suggested that osmotic diuresis be suspected whenever there is polyuria and azotemia associated with intestinal bleeding.

3526 REDUCED SERUM SOMATOMEDIN ACTIVITY IN PATIENTS WITH CHRONIC LIVER DISEASE.

(E.) Wu, A.; Grant, D. B.; Hambley, J.; Levi, A. J. (Northwick Park Hosp. Clin. Res. Cent., Harrow, England). *Clin. Sci. Mol. Med.* 47(4):359-366, 1974.

Serum somatomedin activity in 21 patients with liver disease was studied in relation to fasting serum growth hormone levels and biochemical liver function tests. Ten patients had micronodular cirrhosis, 8 hepatofibrosis, 2 fatty change, and 1 hepatoma. Blood samples were taken by venipuncture after an overnight fast, and somatomedin activity was estimated by chick cartilage assay. Serum growth hormone was estimated by double-antibody radioimmunoassay. The serum somatomedin values were low in 9 patients with cirrhosis (0.042-0.65), 1 with hepatofibrosis (0.27) and the 1 with hepatoma (10.10), relative to values from normal controls. Of these 11, the lowest values were from 5 that had ascites (0.04-0.62). Serum from the patients with low values had no inhibitory effect on control serum activity. Seven of the low value patients had serum growth hormone levels above normal, 6 had low serum albumin (23-33 g/liter), and 8 had high serum total bilirubin (16-117 μM/liter). A significant negative correlation was found between somatomedin activity and alkaline phosphatase. The inverse relationship between somatomedin and growth hormone levels, and the correlation between low somatomedin activity and abnormal liver function tests suggest that the liver is an important site for somatomedin synthesis.

3527 COLLAGEN BIOSYNTHESIS IN LIVER DISEASE OF THE ALCOHOLIC.

(E.) Chen, T. S. N.; Leevy, C. M. (Coll. Med. Dent. N.J., Newark). *J. Lab. Clin. Med.* 85(1):103-112, 1975.

Patterns of collagen synthesis were investigated in alcoholic patients with fatty liver (6), alcoholic hepatitis (4), active Laennec's cirrhosis (8), and normal liver (3). Biopsy specimens were taken 72 hr after treatment for possible vitamin or mineral defiencies. Collagen biosynthesis was measured by *in vitro* incorporation of ^{3}H-proline into the salt soluble and salt insoluble collagen fractions. In one set of experiments, 21.7 μM/ml of ethanol was added to the incubation medium, and incubated 2 hr. Saline was used as a control. Autoradiographic studies of each liver specimen were made, some in which tissues were first digested with collagenase prior to coating with emulsion. It was found that the salt-soluble:salt-insoluble collagen ratio was decreased in both alcoholic hepatitis and cirrhosis, but unchanged in fatty liver. The ^{3}H-proline uptake was significantly increased in fatty liver, hepatitis and cirrhosis in both salt-soluble and insoluble fractions while ^{3}H-hydroxyproline uptake was increased 5-fold in cirrhosis in the salt-soluble collagen and increased in the hepatitis and cirrhosis in the salt-insoluble collagen. The *in vitro* ethanol caused a significant increase in both the ^{3}H-proline and hydroxyproline in the soluble and insoluble fractions in both hepatitis and cirrhosis. In the autoradiographic studies, normal specimens showed sparse labeling of the Kupffer cells, while fatty liver showed a concentration of label in the portal areas and in the hepatocytes. The hepatitis specimens showed labeling of mainly the portal and centrilobular areas, concentrating over many cell types, and the cirrhosis specimens showed labeling in the portal areas, mainly over mesenchymal cells, ductular cells and collagen fibers. It is concluded that salt-insoluble collagen synthesis is increased in alcohol-induced hepatitis and cirrhosis, due to liver cell damage and to the presence of ethanol.

3528 THE FIBRINOLYTIC ENZYME SYSTEM IN ACUTE AND CHRONIC LIVER INJURY.

(E.) Mowat, N. A. G.; Brunt, P. W.; Ogston, D. (Dep. Med., Univ. Aberdeen, Scotland). *Acta Haematol. (Basel)* 52(5): 289-293, 1974.

The major components of the fibrinolytic enzyme system were compared in 35 patients with hepatic cirrhosis (10), alcoholic liver disease (9), primary biliary cirrhosis (9), and chronic active hepatitis (6). In the hepatic cirrhosis patients, although increased plasma fibrinolytic activity was seen in some, the mean level was not significantly different from control values (373 mg/100 ml). The mean plasminogen level, however, was significantly lower (3.9 *versus* 4.4 casein μ/ml), and both α_1-antitrypsin (379 mg/100 ml) and α_2-macroglobulin (399 mg/100 ml) were increased over control values of 275 and 271, resp. The chronic active hepatitis patients were similar to the previous group in their increased activator (5.8 U) and reduced plasminogen activity (3.4 casein μ/ml). In contrast, those with alcoholic liver disease showed decreased activator (2.6 U) and normal plasminogen activities. The patients with primary biliary cirrhosis had low mean activator levels (2.7 U) while fibrinogen (438 mg/100 ml), α_2-macroglobulin levels (364 mg/100 ml) were all significantly elevated. It is concluded that fatty infiltration of the liver is accompanied by the same changes that occur after injury and many acute illnesses: decreased fibrinolytic activity and increased levels of fibrinogen and α_1-antitrypsin. Also, previous findings of reduced fibrinolytic activity and increased fibrinogen levels in cases of primary biliary cirrhosis are confirmed.

3529 LIVER CIRRHOSIS: IMMUNOFLUORESCENCE AND BIOCHEMICAL STUDIES DEMONSTRATE TWO TYPES OF COLLAGEN.

(E.) Gay, S.; Fietzek, P. P.; Remberger, K.; Eder, M.; Kuhn, K. (Max-Planck Inst. Biochem., Munich, Germany). *Klin. Wochenschr.* 53(5): 205-208, 1975.

The collagen synthesized by small- and large-noduled liver cirrhoses was characterized immunohistologically and biochemically. The collagen was prepared from the livers of a 51-yr-old woman with small-noduled liver cirrhosis and a 73-yr-old man with large-noduled liver cirrhosis and liver carcinoma of both hepatocellular and cholangiocellular type. The fibrous septa of both livers showed specific fluorescence with anti-type III collagen antibodies, as did the fibrosing septa of the cholangiocellular liver carcinoma. No fluorescence was seen with anti-type I and II collagen antibodies or normal serum. Pepsin solubilization of the cirrhotic livers yielded two fractions: 40% of the total collagen precipitated at 1.5 M NaCl, and 60% precipated at 2.5 M NaCl. The 1.5 M NaCl precipitate was classified as type III collagen according to its electron microscope characteristics, chromatographic behavior, and pattern of CNBr peptide. Although the 2.5 M NaCl precipitate appeared to be type I collagen under the electron microscope, no reaction could be obtained with anti-type I antibodies and the chromatographic behavior was different from that of type I collagen isolated from the skin. The results suggest an increased rate of biosynthesis of both types of collagen under pathological conditions. The increased type III collagen in the cirrhotic livers was due to hepatic cell necrosis and increased synthesis in the periductular and portal area; the 2.5 M NaCl precipitate was apparently synthesized in the proliferating fibroblasts in the portal tracts. The process of polymerization and possible pathological cross-linking of collagen fibrils may be initiated and enhanced by substances from necrotic hepatocytes; therefore, the balance of interaction between epithelial and mesenchymal cells might be disturbed.

3530 SPONTANEOUS REVERSAL OF PORTAL BLOOD FLOW: THE CASE FOR AND AGAINST ITS OCCURRENCE IN PATIENTS WITH CIRRHOSIS OF THE LIVER.

(E.) Moreno, A. H.; Burchell, A. R.; Reddy, R. V.; Steen, J. A.; Panke, W. F.; Nealon, T. F. (St. Vincent's Hosp., New York, N.Y.). *Ann. Surg.* 181(3):346-358, 1975.

An analysis was made of the evidence for and against the occurrence of spontaneous reversal of portal flow in cirrhosis of the liver. The evidence examined was obtained from an extensive review of the literature including manometric studies, radioactive tracer studies, radiologic studies, and actual measurements of magnitude and direction of portal blood flow. A physical analysis of manometric studies demonstrated that the occluded portal pressures could not be used to construct a hydraulic gradient for portal flow. The evidence derived from radioactive tracer and radiologic studies was also examined and found weak, with conflicting results in the radiologic studies. Actual measurements of magnitude and direction of portal flow provided impressive evidence against the occurrence of spontaneous reversal of portal flow in cirrhosis. The findings suggest that unless new and convincing evidence is provided, it may not serve the best interests of medicine and of patients to continue accepting the unproven phenomenon of spontaneous reversal of portal flow in cirrhosis.

3531 PORTACAVAL SHUNT IN FOUR PATIENTS WITH HOMOZYGOUS HYPERCHOLESTEROLAEMIA. *(E.)*

Stein, E. A.; Mieny, C.; Spitz, L.; Saaron, I.; Pettifor, J.; Heimann, K. W.; Bersohn, I.; Dinner, M. (South African Inst. Med. Res., Johannesburg). *Lancet* 1(7911):832-835, 1975.

The early results of portacaval shunt in four patients with homozygous hyperbetalipoproteinemia are described. The patients, all of whom proved resistant to intensive dietary and drug therapy, were a 7-yr-old boy, a 27-yr-old man, a 16-yr-old girl, and a 10-yr-old boy. Prior to portacaval shunt, all patients were removed from medical treatment and submitted to total parenteral alimentation. During the first 2 weeks they were given a casein hydrolysate, dextrose, electrolyte, and vitamin infusion; during the third week, this was supplemented with infusion of a fat emulsion, the fat content of which was gradually increased to 2 g/kg. End-to-end portacaval shunt was performed at the end of the third week. During the period of parenteral alimentation, the serum cholesterol decreased significantly in all four patients, although during the administration of the fat emulsion, one patient experienced a rise in cholesterol. Postoperatively, the size of xanthomas decreased in all cases; the serum cholesterol levels rose above those achieved during hyperalimentation, and this rise continued for up to 3 months before further reductions were observed. Postoperative triglyceride levels were normal in all patients, and in most patients, bruits decreased in intensity. Improvements in patients with angina were considerable. None of the patients experienced any ill-effects postoperatively. The results indicate that it would be premature to consider all patients with homozygous hypercholesterolemia for portacaval shunt.

3532 SULFATION AND RENAL EXCRETION OF BILE SALTS IN PATIENTS WITH CIRRHOSIS OF THE LIVER. *(E.)*

Stiehl, A.; Earnest, D. L.; Admirand, W. H. (San Francisco Gen. Hosp., Calif.). *Gastroenterology* 68(3):534-544, 1975.

Bile salt sulfation was evaluated in 17 patients with cirrhosis of the liver to determine the importance of that metabolic pathway. Analyses were made of sulfated and nonsulfated free and glycine or taurine-conjugated bile salts in serum, urine, and bile. Gas-liquid chromatography, isotopic studies, and infrared spectroscopy were also carried out. Of the urinary bile salts, 56% were sulfated: 24% of the cholate, 76% of the chenodeoxycholate, 85% of the deoxycholate, and 100% of the lithocholate. Neither sulfated nor nonsulfated bile salts could be detected in urine from two normal subjects. Of bile salts synthesized in the liver, 3-12% were excreted in urine. Sulfated bile salts represented 4-5% of the total bile salts in serum and 7-10% of the total bile salts in bile. Approximately 95% of both sulfated and nonsulfated bile salts in serum, urine, and bile were conjugated with glycine and taurine. Renal clearance of cholate was more than 3 times greater than that of chenodeoxycholate or deoxycholate. Renal clearance of sulfated bile salts was 20-200 times greater than that of the corresponding nonsulfated bile salts. With the exception of serum bilirubin, no direct correlation was found between severity of liver disease and concentrations of bile salts in peripheral blood. The results demonstrate sulfation of bile salts in patients with cirrhosis and the excretion of the sulfated compounds in urine.

3533 LIVER FAILURE AFTER JEJUNOILEAL SHUNT. *(E.)*

Andrassay, R. J.; Haff, R. C.; Lobritz, R. W. (Wilford Hall US Air Force Med. Cent., Lackland Air Force Base, Texas). *Arch. Surg.* 110(3): 332-334, 1975.

An unusual case of liver failure resulting from a jejunoileal shunt is presented. A 41-yr-old woman underwent jejunoileal bypass for morbid obesity, with 35.6 cm of jejunum distal to the ligament of Treitz anastomosed end-to-end to 10.2 cm of ileum proximal to the ileocecal valve. Preoperative evaluation showed normal liver scan, liver function and BSP test results. About 1 yr later she was hospitalized for polyarthritis of unknown etiology. Liver function tests showed elevated alkaline phosphatase (27 King-Armstrong U/100 ml) and serum glutamic oxaloacetic transaminase (153 mμ/ml) values. Liver biopsy showed severe fatty infiltration, marked portal fibrosis with entrapment of hepatocytes, and portal triaditis. Hepatocytic necrosis was seen in some areas. After a month the polyarthritis had spontaneously cleared, but liver function tests showed an elevated level of alkaline phosphatase (320 IU), and elevated levels of SGOT (150 mμ/ml), lactic dehydrogenase (210 IU/liter), creatine phosphokinase (25 IU), and bilirubin (0.8 mg/100 ml). Surgery was performed and normal intestinal anatomy restored. Liver function values returned to normal within 2 months. Biopsy showed complete resolution of the fatty infiltration and hepatocytic necrosis. The case supports the previously proposed potential hazard of liver damage after ileojejunal bypass. It is suggested that these patients be maintained on a high protein and vitamin supplemented diet with avoidance of alcohol, and be kept under close observation for at least 2 yr after surgery.

3534 CLINICAL PHYSIOLOGIC APPROACH TO THE PATIENT WITH PORTAL HYPERTENSION. *(E.)* Chiandussi, L. (Univ. Turin, Italy). *Bull. NY Acad. Sci.* 51(4);557-564, 1975.

Some of the major problems which are encountered in connection with the new techniques available for the clinical investigation of portal hypertension are reviewed. These techniques include direct catheterization of the left branch of the portal vein *via* the round ligament of the liver, catheterization of the celiac trunk and the superior mesenteric artery, and simultaneous catheterization of a main hepatic vein and the left branch of the portal vein. Portal hypertension may arise from thrombosis of the portal vein (extrahepatic portal hypertension), partial occlusion of the hepatic veins (Budd-Chiari syndrome), or, most frequently, intrahepatic block (intrahepatic portal hypertension). Intrahepatic portal hypertension can occur as the result of postsinusoidal block (e.g., veno-occlusive disease, alcoholic hepatitis), intrahepatic block (e.g., cirrhosis, Wilson's disease), or presinusoidal and sinusoidal block (e.g., steatosis, tumors, schistosomiasis, infiltrative diseases, obliterative portal venopathy). Direct catheterization of the portal vein and catheterization of the celiac trunk and the superior mesenteric artery have also contributed to the diagnosis and clinical study of patients with portal hypertension. For example, there is evidence that diversion of portal blood from the liver influences hepatic function and, therefore, survival; the development of reliable methods for the preoperative determination of portal flow in intact patients makes it possible to test this hypothesis by large-scale prospective, controlled studies. Multicentric prospective controlled studied are also needed for: the determination of the survival rate and incidence of encephalopathy in cirrhotics who undergo distal or selective shunt or end-to-side portacaval shunt; the critical evaluation of the medical management of bleeding esophageal varices; and evaluation of the modified Sengstaken-Blackemore tube and the continous infusion of vasopressin or felypressin into the superior mesenteric artery.

3535 CHILDHOOD CRYPTOGENIC CIRRHOSIS AND ANTIMICROSOMAL ANTIBODIES: A NEW SEROLOGICAL MARKER? *(Fr.)* Joannard, A.; Bost, M.; Micouin, C.; Bensa, J. C.; Varloteaux, C.; Beaudoing, A. (Univ. Hosp. Ctr., Grenoble, France). *Pediatrie* 29(6):607-613, 1974.

A 10-yr-old girl, who had been in good health, developed jaundice and signs of portal hypertension when she was hospitalized with pneumococcal pneumonia. Liver function was severely disturbed, and there were signs of hypersplenism. In addition to hypergammaglobulinemia, the IgG concentration was very high (40 g/liter) and the IgA concentration very low (0.30 g/liter). Antimicrosomal antibodies for the liver and kidneys were detected in high titers (1/1000) in the serum by indirect immunofluorescence; they were also present in ascites fluid, but in lower titers. Radiological examinations revealed esophageal varices, and the portal pressure was 50 cm H_2O; no evidence of a prehepatic block was found. At laparoscopy a diagnosis of macronodular cirrhosis was confirmed. A splenectomy was performed in conjunction with an end-to-side portacaval anastomosis 21 days after onset of symptoms. For 6 months after surgery the patient received decreasing doses of corticosteroids. Serum protein levels improved together with improvements in the clinical and biological findings; antimicrosomal antibody titers decreased to 1/200. When corticosteroids were discontinued for 9.5 months, the patient again developed ascites and jaundice, biological findings became abnormal, and antimicrosomal antibody titers increased to 1/1000. Since diuretics and corticosteroids have been reinstituted, all biological findings have improved with the exception of serum alkaline phosphatase levels. Antimicrosomal antibody titers have decreased to less than 1/10. These autoantibodies are relatively rare and have been previously reported in high titers only in 11 young patients with chronic active hepatitis, 15 with various liver diseases, and 6 with extrahepatic or undiagnosed diseases.

3536 CONNECTIVE TISSUE ALKALINE PHOSPHATASE IN THE SERUM: A CRITERION OF THE ACTIVITY OF CHRONIC LIVER DISEASES. *(Ger.)* Liebe, S.; Petzold, H.; Rogos, R. (Dep. Med., Karl Marx Univ., Leipzig, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 34(1): 23-26, 1974.

After dialyzing 20 μl serum against potassium phosphate buffer (0.01 M, pH 7.2) and adding 100 μl of a 20% aqueous sucrose solution, isoenzymes of alkaline phosphatase were separated by electrophoresis in 7% polyacrylamide gel. These studies were performed on fasting sera from 21 patients with cirrhosis and seven patients with chronic aggressive hepatitis undergoing transformation into cirrhosis. Small intestine alkaline phosphatase was detected in sera from 1/2 of these patients, but another isoenzyme, whose electrophoretic mobility was intermediate between that of hepatic and small intestine phosphatases, was present in sera from 2/3 of all patients. In some sera, the latter component was found in combination with the small intestine isoenzyme, while in others, it occurred alone. This isoenzyme has not previously been described in sera from patients with liver disease. Although some literature reports have indicated that this is bone alkaline phosphatase, none of the patients studied had any evidence of skeletal disease. This isoenzyme occurred only in sera from patients whose liver biopsies had strong alkaline phosphatase reactions in the connective tissue. This suggests that the intermediate isoenzyme originates in active connective tissue in the liver, passes over into the serum, and can be detected there by electrophoresis. Since connective tissue proliferation is regarded as a criterion for the activity of cirrhosis, the detection of connective tissue phosphatase in the serum can be considered indirect evidence of active cirrhosis.

3537 PLASMA PHOSPHATIDE PATTERN IN ACUTE AND CHRONIC LIVER DISEASE. *(Ger.)* Jipp, P.; Ravens, K. G.; Salm, M. (Med. Clin., Univ. Kiel, Germany). *Klin. Wochenschr.* 52(16):759-762, 1974.

Total phospholipid concentrations and the concentrations of lysolecithin, sphingomyelin, lecithin, and phosphatidylethanolamine were determined by thin-layer chromatography in plasma from 18 patients (eight women and 10 men; mean age 45 yr) with acute hepatitis; 37 patients (13 women and 24 men; mean age 57 yr) with cirrhosis; 10 patients (one woman and nine men; mean age 44 yr) with fatty liver and 30 normal controls (11 women and 19 men; mean age 40 yr). Except for an increase in the mean concentration of phosphatidylethanolamine, the phospholipid pattern was normal in patients with fatty liver. While no significant difference was found between the mean concentrations of total plasma phospholipids in cirrhotics and controls, the mean lysolecithin concentration was decreased and the mean phosphatidylethanolamine concentration increased in cirrhosis. Two weeks after the onset of acute hepatitis, the mean concentrations of total phospholipids, sphingomyelin, lecithin, and phosphatidylethanolamine were increased and the mean concentration of lysolecithin was decreased. No correlations were found between changes in phospholipid levels and the results of liver function tests. The lysolecithin: lecithin ratio was significantly lower in patients with acute hepatitis and cirrhosis than in controls. Differences in changes occurring in lecithin and lysolecithin are considered to be the result of a decrease in lecithin-cholesterol acyl transferase activity.

3538 CLINICAL STUDY ON THE COMPETITIVE HEPATIC EXCRETION OF BILIRUBIN AND SULFOBROMOPHTHALEIN. *(Sp.)* Alves, J.; Santolaria, F.; Cabarcos, A.; Huguet, R.; Bruguera, J. A.; Liso, P. (Fac. Med., Univ. Navarra, Pamplona, Spain). *Rev. Esp. Enferm. Apar. Dig.* 44(7):687-696, 1974.

The 45-min BSP retention test was performed on five patients with liver disease and nine controls by slow i. v. injection of 5 mg/kg BSP. Bilirubin levels were measured before injection of BSP and 72 hr later. These studies were performed on one patient with extrahepatic obstructive jaundice, two with alcoholic cirrhosis, one with chronic aggressive hepatitis, and one with cryptogenic cirrhosis. In the patient with extrahepatic obstructive jaundice, injection of BSP increased total serum bilirubin levels by 36.8% (36.8% for direct, 38.4% for indirect). In contrast, no appreciable change occurred in serum bilirubin levels in the other four patients with liver disease, whether they were jaundiced or not, or in the controls. No correlations were found between increases in bilirubin levels, when they occurred, and the initial bilirubin values in jaundiced patients, the degree of hepatomegaly, or the results of liver function tests. In extrahepatic obstructive jaundice, increases in serum BSP and bilirubin levels are due to competition between these two substances in the hepatocytes. In patients with intrahepatic disease, the liver has lost its ability to conjugate and transport BSP but not bilirubin.

3539 α_1-ANTITRYPSIN DEFICIENCY IN INFANTS: CLINICAL, BIOCHEMICAL, MORPHOLOGICAL, IMMUNOHISTOCHEMICAL, AND GENETIC FINDINGS IN TWO INFANTS. *(Ger.)* Exss, R.; Rotthauwe, H. W.; Schattenberg, P. J.; Totovic, V.; Muller, R.; Sennekamp, J.; Benkmann, H. G.; Goedde, H. S. (Pediatr. Clin., Univ. Bonn, Germany). *Dtsch. Med. Wochenschr.* 100(6):222-228, 1975.

Case reports are presented for two infants who developed cholestatic jaundice by age 3 and 6 weeks, resp. Examination of liver biopsies showed the presence of globular eosinophilic inclusions in the cytoplasm of many parenchymal cells and perilobular fibrosis. The inclusions gave a positive reaction with PAS reagent, were diastase-resistant, and stained selectively with fluorescein-labeled rabbit antihuman α_1-antitrypsin. Under the electron microscope, these deposits of α_1-antitrypsin appeared to be amorphous material in dilated cisternae of the endoplasmic reticulum. Family studies of serum α_1-antitrypsin levels showed that both infants were homozygous for the protease inhibitor (Pi) gene. In one case, the patient's father and paternal aunt were also homozygotes, while the mother, paternal grandparents, and maternal grandmother were heterozygotes. In the other case, the parents, paternal grandmother, and maternal grandfather were heterozygotes. These findings are consistent with an autosomal codominant inheritance. Except for slight hepatomegaly, neither patient had clinical symptoms at age 1 yr. However, serum transaminase and γ-glutamyl transpeptidase levels remain slightly elevated.

3540 DEFECTIVE REGULATION OF CHEMOTAXIS IN CIRRHOSIS. *(E.)* Maderazo, E. G.; Ward, P. A.; Quintiliani, R. (Hartford Hosp., Connenticut). *J. Lab. Clin. Med.* 85(4):621-630, 1975.

The possibility of a chemotactic defect was investigated in 11 cirrhosis and three hepatitis patients. All the cirrhotic patients had a history of excessive alcohol intake, and presented with muscular wasting, icterus, and ascites. Serum albumin ranged from 2.0-3.1 g% and total bilirubin from 2.9-16.0 mg%. The three hepatitis patients had acute hepatitis believed to be caused, resp., by alcohol, halothane, and methimazole. Serum transaminase levels ranged from 113-1850 U/dl, serum albumin from 3.5-4.4 g%, and total bilirubin from 0.4-12.8 mg%. Neutrophils were obtained by sedimentation of heparinized blood in an equal volume of 6% dextran in phosphate buffered saline, low speed centrifugation, and resuspension in medium 199. Chemotactic assays were performed. Sera were also ultracentrifuged and assayed for chemotactic factor inactivator. For controls, neutrophils and sera of healthy adults were assayed. Two of the cirrhotic sera reduced chemotactic activity by 64% and 90% while control serum caused no fall in activity. Nine of the cirrhotic sera reduced activity 97-99% while alcoholic hepatitis serum reduced it only 17% and control serum produced no inactivation. Serum from a patient with juvenile cirrhosis associated with α-$_1$antitrypsin deficiency showed 36% inactivation, while sera from the halothane and methimazole-induced hepatitis showed little or none. These chemotactic defects were seen only when normal or cirrhotic neutrophils were suspended in the presence of cirrhotic serum. To distinguish between the inhibitory effect of cirrhotic serum on neutrophils as opposed to chemotactic factors, cirrhotic serum was incubated with bacterial chemotactic factor, and then heat-inactivated. Other sera were heat-inactivated first, and then incubated. Using normal neutrophils, it was found that unheated cirrhotic, but not normal serum, would inactivate the chemotactic factor, while the preheated serum lost its inactivating power. Comparison of bacterial chemotactic factor with C3 and C5 fragments, showed that all three factors were inactivated by cirrhotic serum. Ultracentrifugation showed that chemotactic factor inactivator activity appeared between the albumin and cytochrome markers in seven cirrhotic sera, while in three others a small zone of activity was near the IgG marker. In three more, activity peaked only in the upper zone of the gradients. Incubation with zymosan showed generation of significantly less chemotactic activity in cirrhotic than normal sera. It is concluded that in cirrhotic patients there is a chemotactic defect, associated with the serum but not the leukocytes, which is attributable to supernormal levels of chemotactic factor inactivator.

3541 CIRRHOSIS IN A PATIENT WITH α_1-ANTITRYPSIN DEFICIENCY. AN ULTRASTRUCTURAL AND IMMUNOCYTOCHEMICAL STUDY. *(Fr.)* Geffroy, Y.; Colin, R.; Martin, J. P.; Feldmann, G.; Hemet, J.; Joram, F. (Charles Nicolle Hosp., Rouen, France). *Arch. Fr. Mal. App. Dig.* 63:495-502, 1974.

3542 ANTIBODIES AGAINST SOME BACTERIAL AND NON-BACTERIAL ANTIGENS IN CHRONIC HEPATITIS AND CIRRHOSIS. *(Cz.)* Petera, V.; Zavazal, V.; Vosmik, J. (Med. Fac., Charles Univ., Plzen, Czechoslovakia). *Cas. Lek. Cesk.* 113(42):1287-1289, 1974.

3543 STATISTICAL ANALYSIS OF SOME CLINICAL AND BLOOD CHEMISTRY PARAMETERS IN 100 PATIENTS WITH CIRRHOSIS. *(It.)* Scanni, A.; Ferrari, P.; Bianchi, A. E. (Ciceri-Agnesi Hosp. Fatebenefratelli Fatebenesorelle, Milan, Italy). *Fegato* 19(3):626-634, 1973.

3544 DETERMINATION OF SPECIFIC HEPATIC BLOOD FLOW USING ^{133}Xe AND ^{85m}Kr WITH AN INHALATION TECHNIQUE. *(Ger.)* Schmitz-Feuerhake, I.; Huchzermeyer, H.; Frohlich, H.; Reblin, T. (Med. Coll., Hannover, Germany). *Z. Gastroenterol.* 12(Suppl.):405, 1974.

3545 PHAGOCYTIC FUNCTION OF THE SPLEEN IN CHRONIC DISEASES OF THE LIVER. *(Rus.)* Novopashennaia, V. V. (Kiev Inst. Postgrad. Med., USSR). *Vrach. Delo* (10):23-26, 1974.

3546 STATE OF THE PHYSICO-CHEMICAL PROPERTIES OF BILE IN LIVER CIRRHOSIS. *(Rus.)* Khvorostinka, V. N. (S. M. Kirov Acad. Mil. Med., Leningrad, USSR). *Vrach. Delo* (10):27-31, 1974.

3547 BILE ACIDS IN THE SERUM AND URINE OF PATIENTS WITH DECOMPENSATED LIVER CIRRHOSIS. *(Ger.)* Wildgrube, H. J.; Dittman, K.; Erb, W. (Cent. Intern. Med., Univ. Frankfurt/Main, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:953-954, 1973.

3548 CHANGES IN GASTRIN, DETERMINED RADIOIMMUNOLOGICALLY AFTER STIMULATION, IN PATIENTS WITH CIRRHOSIS. *(Ger.)* von Berger, L.; Raptis, S.; Wannagat, L.; Pfeiffer, E. F. (Cent. Intern. Med. Pediatr., Univ. Ulm, Germany). *Z. Gastroenterol.* 12(suppl.):416-417, 1974.

3549 POSTHEPARIN DIAMINE OXIDASE (HISTAMINASE) IN ACUTE AND CHRONIC LIVER DISEASE. *(Ger.)* Gang, V. (Med. Clin., Univ. Wurzburg, Germany). *Z. Gastroenterol.* 12(suppl.):407-408, 1974.

3550 STUDY OF CELLULAR IMMUNITY IN CIRRHOTICS USING THE NATURAL ROSETTE TEST. *(Fr.)* Dubois, J. B.; Serrou, B.; Bert, J. M.; Balmes, J. L. (Saint Eloi Hosp., Montepellier, France). *Rev. Fr. Gastroenterol.* (95):17-18, 21-22, 24, 27, 1974.

3551 SCLEROSING OF THE ESOPHAGEAL WALL IN THE TREATMENT OF ACUTE BLEEDING FROM ESOPHAGEAL VARICES AND THREATENED BLEEDING WITH DECOMPENSATED LIVER FUNCTION. *(Ger.)* Paquet, K. J.: Engel, C. (Surg. Clin., Univ. Bonn, Germany). *Z. Gastroenterol.* 12(Suppl.):395-399, 1974.

3552 LONG-TERM SILYMARIN THERAPY FOR OUTPATIENT CIRRHOTICS. *(Ger.)* Benda, L.; Zenz, W. (Floridsdorf Munic. Hosp., Vienna, Austria). *Therapiewoche* 24(38):3598-3600, 3603-3606, 3608, 1974.

3553 THE ROLE OF RENO-PORTAL ANASTOMOSIS IN THE SURGICAL TREATMENT OF PORTAL HYPERTENSION WITH A REPORT OF 21 ORIGINAL CASES. *(It.)* Saubier, E. C.; Brault, J. A.; Russo, A.; Partensky, C. (Edouard Herriot Hosp., Lyon, France). *Chir. Gastroenterol.* 8(2):196-213, 1974.

3554 THE MOTOR FUNCTION OF THE SMALL INTESTINE IN PORTAL HYPERTENSION AND AFTER ITS CORRECTION. *(Rus.)* Eremenko, V. P.; Kataeva, G. A.; Zykov, L. I. (S. M. Kirov Acad. Mil. Med., Leningrad, USSR). *Klin. Med. (Mosk.)* 51(11):88-95, 1973.

3555 CLINICAL FINDINGS DURING CATHERIZATION OF THE SUPERIOR HEPATIC VEINS. *(It.)* Mattioli, F.; Torre, G. C. (Inst. Clin. Surg. Ther. I, Univ. Genoa, Italy). *Chir. Gastroenterol.* 8(1):58-78, 1974.

3556 PRIMARY BILIARY CIRRHOSIS AND SCLERODERMA. *(E.)* August, P. J. (St. Thomas' Hosp., London, England). *Proc. R. Soc. Med.* 67(12):1238-1239, 1974.

3557 PLASMA AMINO ACID PROFILES OF PORTACAVAL SHUNTED HUMANS COMPARED TO LABORATORY RODENT MODELS. *(E.)* Hupp, J.; Brown, H. (Boston City Hosp., Mass.). *Fed. Proc.* 34(3):394, 1975.

3558 END-TO-SIDE SPLENORENAL SHUNT FOR TREATMENT OF PORTAL HYPERTENSION. *(E.)* Gill, S. S.; Eggleston, F. C.; Singh, C. M. (Christian Med. Coll., Punjab, India). *Arch. Surg.* 110(3):254-257, 1975.

3559 LIVER FUNCTION, AGE AND PORTASYSTEMIC ENCEPHALOPATHY. *(E.)* Kardel, T. (Gentofte Hosp., Copenhagen, Denmark). *Neth. J. Med.* 17(2):50-53, 1974.

3560 CURRENT CONCEPTS RELATING TO METABOLIC CHANGES AFTER PORTACAVAL SHUNTS, AND ALCOHOL AND THE PANCREAS. (1) PORTACAVAL SHUNTS. *(E.)* Hicknam, R.; Crosier, J. H.; Meyers, O. L.; Engelbrecht, G. H. C.; Keraan, M.; Immelman, E. J.; Terblanche, J. (Dep. Surg. Med., Univ. Cape Town, South Africa). *S. Afr. J. Surg.* 12(4):201-202, 1974.

3561 SURGERY AND PROGNOSIS OF PREHEPATIC PORTAL HYPERTENSION. *(E.)* Rapant, V.; Kralik, J. (Univ. Surg. Clin., Olomouc, Czechoslovakia). *Int. Surg.* 60(3):144-149, 1975.

3562 SOME ASPECTS OF ^{35}S-METHIONINE METABOLISM IN HEPATIC CIRRHOSIS. *(E.)* Szantay, J.; Szirmai, E.; Cotul, S. (Dep. Int. Med., Univ. Cluj, Roumania). *Mater. Med. Pol.* 6(2):120-122, 1974.

3563 TRENDS IN MORTALITY DUE TO CIRRHOSIS OF THE LIVER IN ALLEGHENY COUNTY - COMPARISON WITH BALTIMORE, MARYLAND. *(E.)* Kuller, L. H.; Perper, J. A.; Hersherson, S. (Grad. Sch. Public Health, Univ. Pittsburgh, Pa.). *Pa. Med.* 78(4):61-65, 1975.

3564 SERUM GASTRIN IN PATIENTS WITH CIRRHOSIS OF THE LIVER. *(E.)* Mazzacca, G.; Budillon, G.; De Marco, F.; De Ritis, F. (2nd Sch. Med., Univ. Naples, Italy). *Digestion* 11(3/4):232-239, 1974.

See also, 2664, 2863, 2890, 2922, 2930, 2931, 2932, 2960, 3000, 3344, 3352, 3361, 3368, 3387, 3488, 3490, 3491, 3493, 3496, 3751.

LIVER AND BILIARY TRACT

Gallbladder and Biliary Tract Diseases

3565 DISSOLUTION OF STONES IN THE COMMON BILE DUCT WITH BILE-SALT SOLUTIONS. *(E.)* Toouli, J.; Jablonski, P.; Watts, J. M. (Prince Henry's Hosp., Monash Univ., Melbourne, Australia). *Aust. NZ J. Surg.* 44(4):336-340, 1974.

A method is presented for treatment of common bile duct stones discovered after surgical exploration. Retained stones were found in the common bile duct of 14 post-cholecystectomy and two post-cholecystostomy patients treated for acute cholecystitis with removal of the gallbladder stones. Treatment consisted of infusion through the indwelling T-tube or cholecystostomy tube of sterile bile salt solution at 4-6 ml/hr for 10 days. Nine of the patients received an infusion of 200 mM sodium taurocholate, and the other seven received 200 mM sodium cholate. Cholestyramine (4 g) was given p.o. every 6 hr during infusion. If cholangiography revealed improvement after 10 days, treatment was continued, otherwise it was stopped. Stones disappeared in 12 patients, were reduced in size by 1/3 in one, and were unchanged in three. Of these three, one was unable to tolerate the cholestyramine and developed diarrhea; the remaining two were the cholecystostomy patients. In one of these, proper infusion could not be achieved due to leakage around the infusion catheter. In the other the stone may have been of insoluble pigment rather than cholesterol. Side effects included diarrhea (two patients), biliary pain (3), and pyrexia and chills in one. It is concluded that this method is effective and should be attempted before surgical re-exploration is considered.

3566 ENDOSCOPY OF THE BILE DUCT: AN EVALUATION. *(E.)* Leslie, D. (R. Melbourne Hosp., Australia). *Aust. NZ J. Surg.* 44(4):340-342, 1974.

The use of endoscopy in 504 biliary tract operations is reviewed. Of 5 types of instruments (2 types of Sass Wolf, 2 types of Storz, and 1 A.C.M.I. flexible model) the Storz models were the most effective. The A.C.M.I. had poor image and depth of focus, and disorientation occurred as a result of torsion. The Storz models were narrower, more efficient, and had better accessories than the Sass Wolf models. The instrument proved useful in determining patency of the duodenal papilla and in removal of residual stones under visual control. Residual stones were removed in 22% of the patients. Endoscopy was also useful in removal of awkward stones, demonstration of anatomical abnormalities, and discovery of latent pathological lesions such as papillomata, pancreatic carcinoma, fibrosis or edema of the papilla, and cholangitis. Mortality was negligible and in no case did choledochoscopy contribute to cause of death. Wound infection rate was the same as for cholecystectomy with no common bile duct exploration (6%). Operative cholangiography was found to be useful in determining necessity of exploration of the duct. However, 11 of 91 explorations proved to be unnecessary. It is concluded that choledochoscopy is safe, has more to offer than cholangiography, and should be routinely performed after cholangiography.

3567 BONE DISEASE IN INFANTS WITH PROLONGED OBSTRUCTIVE JAUNDICE. *(E.)* Thomas, P. S.; Glasgow, J. F. T. (R. Belfast Hosp. Sick Child., Northern Ireland). *Pediatr. Radiol.* 2(2):125-132, 1974.

Four cases of infants with obstructive jaundice associated with rickets are presented. One case was of intrahepatic cholestasis present from birth, and decreased slowly in severity over 4 weeks without specific treatment. Marked decalcification of the bones was noted 2 weeks after discharge from the hospital. The second case had obstructive jaundice from birth associated with Rhesus isoimmunization. The liver and spleen were enlarged. At 4 months, x-rays showed mild rachitic changes of the wrists and knees. Oral phenobarbitone decreased serum bilirubin level to normal; however, the rachitic changes became more pronounced. Large doses of vitamin D subsequently corrected this and growth became normal. In the third case, jaundice from complete obstruction was noted soon after birth. Laparotomy disclosed extrahepatic biliary atresia. Skeletal x-rays showed lucent zones at the long bone metaphyses and encircling the round bones, presumably due to growth arrest. Vitamin D therapy was begun at 7 weeks of age, but the bony changes were slow to heal and growth remained poor. In the last case, jaundice was noted at 4 weeks of age, and laparotomy disclosed extrahepatic biliary atresia. Rachitic rosary and frontal bossing were noted. Vitamin D therapy was not begun until 13 months of age, and gross limb disease and permanent deformity resulted. Because of the differing etiology of the jaundice in the four infants, it is suggested that reduced bile salts in the intestine may be the major etiological factor in the development of the rickets. Because the severity of the rickets was directly related to the amount of time before vitamin D therapy was begun, it is suggested that infants with jaundice be given prophylactic doses of fat soluble vitamins.

3568 DUODENAL BILE ACIDS AFTER A TEST MEAL. *(E.)* Fausa, O. (Rikshosp., Oslo, Norway). *Scand. J. Gastroenterol.* 9(6):567-570, 1974.

Bile acids in duodenal aspirates after test meal stimulation of gallbladder emptying were examined in 12 healthy volunteers (4 women and 8 men, ranging in age from 20-46 yr), using a purified 3α-hydroxysteroid dehydrogenase for the quantitative determination. An average total bile acid concentration of 14.5 μM/ml (range 5.8-39.6) was found. All bile acids were conjugated, the mean ratio of glycine-conjugated to taurine-conjugated bile acids being 3.2. The bile acids were conjugated in the same proportions with glycine and taurine. Expressing the relative proportions of the 3 major bile acids as % of the total, the average value for cholic acid was 40% (range 25-50), chenodeoxycholic 40% (range 30-52), and deoxycholic 20% (range 10-35). These results are in agreement with previously published findings, in which varying methods for gallbladder emptying and for bile acid separation and quantification were used. It is concluded that the method using a purified 3α-hydroxy-steroid dehydrogenase may advantageously be used in the study of duodenal bile acids.

3569 THE INCIDENCE OF SECONDARY COMMON BILE DUCT EXPLORATION. *(E.)* Duff, J. H.; Salvian, A. G.; Finley, R. (Victoria Hosp., London, Canada). *Surg. Gynecol. Obstet.* 139(5):723-725, 1974.

A retrospective analysis was carried out of all secondary common bile duct explorations done at 2 major teaching hospitals in London, Canada during a period of 15 yr to determine the incidence of secondary common bile duct exploration, and to see if the incidence varies with the method of the primary procedure. A total of 112 patients had a secondary common bile duct exploration during the 10-yr period from 1963-1972. At least 1/3 of the patients (46 of 112) already had a common bile duct exploration at the time of cholecystectomy. In these hospitals, 36% of the patients undergoing cholecystectomy have an operative cholangiogram, 13.6% have common duct exploration and 55.2% have cholecystectomy alone. When the group of 112 patients undergoing secondary common bile duct exploration was subdivided according to the method of the initial prodedure, the lowest incidence of secondary common bile duct exploration occurred in patients having operative cholangiograms with cholecystectomy, 0.3-1.0%, and the highest, in those who initially had cholecystectomy and common bile duct exploration, 3.8-5.3%. For cholecystectomy alone, the incidence was 1.2-1.9%. These findings support the selective use of cholangiography with cholecystectomy, although the benefits are small in terms of percent reduction in the incidence of secondary common bile duct exploration. Operative cholangiography may be useful, however, in reducing the number of negative findings at common bile duct exploration performed on the basis of clinical criteria. This is of significant benefit because the frequency of finding stones in the common duct seldom has been above 50%. There was little evidence for the view that performance of a cholangiogram is mandatory with every cholecystectomy. The patients at greatest risk of having retained stones and requiring secondary common bile duct exploration are those who undergo cholecystectomy and common bile exploration as the initial procedure.

3570 CANALICULAR BILE PRODUCTION IN MAN. *(E.)* Prandi, D.; Erlinger, S.; Glasinovic, J. C.; Dumont, M. (INSERM, Beaujon Hosp., Clichy, France). *Eur. J. Clin. Invest.* 5(1):1-6, 1975.

Bile flow, erythritol clearance and bile acid excretion were studied in eight non-icteric patients, aged 47-83 yr, operated upon for gallstone disease without biliary obstruction and in whom T-tubes had been inserted. Bile flow increased from the second (0.27 ml/min) to the seventh (0.50 ml/min) postoperative days and remained stable thereafter. Because the values obtained between the seventh and the 15th postoperative days (average 0.46 ml/min) were not lower and were of the same order of magnitude as those previously reported in the literature for quantitative bile collections, it was assumed that bile collection had been complete. Bile:plasma concentration ratio of erythritol, measured following a single i.v. injection and during constant i.v. infusion of ^{14}C-erythritol, was 0.77. The regression line between erythritol clearance and bile flow had a slope of 0.99 (indicating that increments in clearance were followed by equivalent increments of flow) and an intercept for a zero-clearance of 0.11, suggesting a ductular/ductal secretion of 0.11 ml/min. The relationship between erythritol clearance and bile acid excretion suggested that canalicular bile was formed both of a bile acid-dependent flow (11 µl of water being excreted per µM of bile acid secreted) and a bile acid-independent flow of 0.16 ml/min (or 35% of the average bile flow). These findings indicate that erythritol clearance provides a valid estimate of canalicular bile flow in man and that the three bile fractions previously postulated in animals (canalicular bile acid-dependent, canalicular bile acid-independent and ductular/ductal) may also be present in man.

3571 TREATMENT OF GALLSTONES WITH CHENODEOXYCHOLIC ACID AND PHENOBARBITAL. *(E.)* Coyne, M. J.; Bonorris, G. G.; Chung, A.; Goldstein, L. I.; Lahana, D.; Schoenfield, L. J. (Cedars-Sinai Med. Cent., Los Angeles, Calif.). *N. Engl. J. Med.* 292(12):599-656, 1975.

The effects of treatment with chenodeoxycholic acid (750 mg/day) and/or phenobarbital (180 mg/day) were studied in 22 women and 14 men with asymptomatic radiolucent gallstones and radiologically visualized gallbladders. After 1 yr, chenodeoxycholic acid, phenobarbital and the combination, but not placebo, significantly decreased biliary cholesterol saturation. This effect was significantly greater with chenodeoxycholic acid and the combination than with phenobarbital. Gallstone size decreased more than 50% in nine of 20 patients receiving chenodeoxycholic acid, either alone or combined with phenobarbital, but in no patient receiving only phenobarbital or placebo. Gallstones disappeared completely in patients receiving the combination. Abnormalities in liver-function tests in three of 36 patients, and in five of 16 liver biopsies, occurred with equal frequency in the four treatment groups. Thus, after 1 yr, phenobarbital alone was ineffective in gallstone dissolution. Chenodeoxycholic acid alone or combined with phenobarbital, however, offered a partially effective and safe treatment for asymptomatic radiolucent gallstones.

3572 MITRAL VALVE DEFECTS AND BILIARY DISEASE. *(Ger.)* Koelsch, K. A.; Zemlin, C. (Altstadt Reg. Hosp., Magdeburg, Germany). *Z. Gesamte Inn. Med.* 30(2):51-54, 1975.

Of 184 women, aged 21-84 yr (mean 61.3 yr) who died with a mitral valve defect between 1961 and 1971, 80 (43.5%) had biliary disease. These patients consisted of 76 (41.3%) who either had cholelithiasis or had undergone surgery for it; two with acalculous cholecystitis; and two with cholesteatosis. Of these 184 women, 120 had undergone 1-10 pregnancies. The incidence of biliary disease among these women was only 38.3%, while 26 of the 42 nulliparae (61.9%) had biliary disease. Women who died before the age of 50 generally had the most severe mitral valve defects and the highest incidence of biliary disease, suggesting that there is a correlation between the severity of the heart disease and the incidence of cholelithiasis. This was confirmed by comparing the incidence of biliary disease as a function of the type of mitral valve defect. The incidence of cholelithiasis was highest among women who had damage to other heart valves in addition to the mitral valve (51.1%) and among those with mitral insufficiency (50.0%). Cholelithiasis was also found in three of the five women with defects of the tricuspid, mitral, and aortic valves; two of these three patients had cirrhosis, and the liver was undergoing cirrhotic transformation in the third. Of 21 patients with severe liver disease (cirrhotic transformation, cardiac cirrhosis, or other forms of cirrhosis), 13 (61.8%) had biliary disease. No association was found between biliary disease and obesity or diabetes mellitus in this group of patients.

3573 RACIAL INFLUENCE ON THE INCIDENCE OF BILIARY ATRESIA. *(E.)* Shim, W. K. T.; Kasai, M.; Spence, M. A. (Univ. Hawaii Med. Sch., Honolulu). *Prog. Pediatr. Surg.* 6:53-62, 1974.

Estimates of the incidence of biliary atresia for seven major races in Hawaii were obtained. The rate of biliary atresia in Hawaii differs significantly among some of the groups: 0.6/10,000 births for Caucasians, 0.8 for Japanese, 2.0 for Filipinos, and 3.0 for Chinese. There is a 5-fold difference between the Caucasian and Chinese rates. The incidence of biliary atresia among Japanese in Sendai, Japan, is almost exactly the same as it is for the Japanese of Hawaii. The rate for both Japanese and Caucasians is similar, which is contrary to the impression of some pediatric surgeons. When the incidence of biliary atresia is based on hospital admissions, very disparate and non-comparable figures for Hawaii and Sendai are obtained. The reasons for this difference probably reside in the fact that these figures reflect additional variables, such as referable patterns. When incidences are compared on a geographical basis, the rates are dependent upon the racial composition of the local population under consideration. A conglomerate figure for several races is meaningless, so that racial incidence is probably more accurate in comparing disease rates. Regression analysis demonstrated that father's age, mother's age, father's race, and birth weight are all significant variables and correlate with the incidence of biliary atresia. However, these factors did not account for more than 1% of the variation and leave 99% of the variation in the etiology of biliary atresia still unexplained.

3574 DIAGNOSTIC EVALUATION OF VARIOUS TECHNIQUES FOR EXAMINING THE DUODENUM IN PATIENTS WITH RECURRENT PAIN AFTER CHOLECYSTECTOMY.

(Rus.) Buianov, V. M.; Vorobiev, L. P. (N. I. Pirogov 2nd Med. Inst., Moscow, USSR). *Ter. Arkh.* 46(4):48-53, 1974.

Examination of the duodenum and the papilla of Vater was carried out in 106 patients with recurrent pain after cholecystectomy to reveal a variety of organic and functional changes in the duodenum in patients with postoperative syndromes. Directed roentgenological examination showed that 1/3 of the 98 patients had dyskinesia, and 20 patients had duodenitis. In addition to regular x-ray examination, 36 patients had their duodenum x-rayed in conditions of atropine-induced hypotonia. As a result, pancreatitis was found in 12 patients, papillitis in two, and duodenitis in six; no changes were observed in 16 patients. Duodenoscopy revealed that of the 54 patients examined, 28 had duodenitis; 12, acute or stenotic papillitis; seven indirect signs of the inflammation in the head of the pancreas. It is concluded that 2/3 of the examined patients had functional or morphologic changes in the duodenum and the papilla of Vater. Of the available diagnostic techniques, duodenoscopy appears to be the most effctive in combination with duodenometry and duodenography.

3575 STENOSING LESIONS OF THE BILIARY TREE: EVALUATION WITH ENDOSCOPIC RETROGRADE CHOLANGIOGRAPHY (ERC) AND PERCUTANEOUS TRANSHEPATIC CHOLANGIOGRAPHY (PTC).

(E.) Geisse, G.; Melson, G. L.; Tedesco, F. J.; Kelly, J. J.; Stanley, R. J. (Washington Univ. Sch. Med., St. Louis, Mo.). *Am. J. Roentgenol. Radium Ther. Nucl. Med.* 123(2):378-385, 1975.

Nine patients with localized or diffuse stenosing lesions of the biliary tree and a tenth patient with a by-passing choledochojejunostomy were evaluated using endoscopic retrograde cholangiography (ERC) and/or percutaneous transhepatic cholangiography (PTC). The patients were premedicated with atropine (0.6 mg, i.m.), meperidine (50 mg, i.m.), diazepam (10-20 mg, i.v.), and a pharyngeal spray containing 2% tetracaine; they were examined with the Olympus duodenofiberscope JF Type B. ERC revealed intra- and extrahepatic narrowing and marked luminal irregularity consistent with sclerosing cholangitis in three patients. In two of these patients, the cholangitis was associated with ulcerative colitis. In a fourth case, ERC demonstrated extensive intermittent narrowing of the intrahepatic duct system highly suggestive of secondary sclerosing cholangitis; open wedge liver biopsy showed marked ascending cholangitis with periductal fibrosis. In another case, ERC showed high-grade stenosis confined to the junction of the left and right hepatic ducts; the diagnosis of primary scirrhous carcinoma was confirmed at surgery. Uncomplicated, discrete, postsurgical extrahepatic strictures were demonstrated in three additional cases; in one of these, PTC was needed to supplement the diagnostic evaluation in that ERC did not show the length of stricture or appearance of the biliary tree proximal to the stricture. In the tenth case, PTS demonstrated stricture at the choledochojejunal anastomosis and a peculiar rectangular filling defect within an hepatic duct proximal to the stricture; the interpretation of a retained portion of surgical stint was confirmed at surgery. When supplemented with the appropriate use of PTC, many lesions of the biliary treat which heretofore were not diagnosable preoperatively can be clearly defined with ERC. These techniques are of value in diagnosis, determination of prognosis, and the provision of visual data on which to plan a surgical approach.

3576 CHOLELITHIASIS IN CHILDREN.

(Ger.) Jenny, P.; Ferel, G.; Herzog, B. (Child. Hosp., Basel, Switzerland). *Helv. Chir. Acta* 41(5/6):757-759, 1974.

Five cases of cholelithiasis in children in the patient material of the Basel Children's Hospital during the 1951-1973 period are reported. The incidence was in agreement with literature data indicating one case out of 7,000 to 12,000 admissions. The patients, four females and one male, were aged 6.5-14 yr at the time of the operation. Spherocytosis with hemolysis was diagnosed in two cases as an underlying disease, and portal hypertension with esophageal varices was found in two other cases. The etiology was obscure in one case. No increased frequency of cholelithiasis was found in any of the respective families. Epigastric pains were found to be the principal symptom of the disease, while colic was infrequent. Cholecystectomy was successful in four cases, and a pea-sized solitary stone was removed by cholecystotomy in another case.

3577 INTERNAL DIAMETER OF THE COMMON BILE DUCT AND ITS SIGNIFICANCE IN EVALUATING THE BILIARY TRACT DURING SURGERY.

(Ger.) Persenico, S. G.; Schamaun, M. (Rhaetian Canton. Reg. Hosp., Chur, Switzerland). *Helv. Chir. Acta* 41(5/6):615-618, 1974.

The internal diameter of the common bile duct was determined in 252 adult patients with diseases of the biliary duct by intraoperative cholangiography, using a new radiomanometric method, to establish relationships between the internal diameter of the common bile duct and the incidence of pathological conditions. The findings indicate that it is impossible to infer any pathological conditions from the internal diameter of the common bile duct in a range of 5 to 11 mm. However, the probability of pathological changes increases with the internal diameter. While the probability of pathological changes is very slim at diameters below 8 mm, it increases to 23.5% at 9 mm, to 40% at 10 mm, and to 57% at 11 mm diameter. Internal diameters greater than 11 mm were found to be always indicative of pathological changes of the common bile duct. The internal diameter of the common bile duct was found to be independent of sex and the duration of the symptoms, while a slight increase in diameter with advancing age was observed.

3578 PRIMARY SCLEROSING CHOLANGITIS. *(Ger.)*

Arma, S.; Fleischer, M.; Fumagalli, I. (B. V. Hosp., Mendrisio, Switzerland). *Helv. Chir. Acta* 41(5/6):699-703, 1974.

Primary sclerosing cholangitis in a 73-yr-old male patient is described. Cachexia, pruritus, mild intermittent obstructive jaundice, and bilirubin levels between 4 and 6 mg% were the first findings. Slight hepatomegalia, considerable thickening of the walls of the gallbladder and of the extrahepatic bile duct, enlarged lymph nodes in the hepatoduodenal ligament, and pronounced collagen proliferation with lymphocyte and plasmocyte infiltration of the gallbladder wall were found during choledochoduodenostomy. Total regression was acheived in a relatively short time following surgery and corticosteroid (betamethasone) therapy.

3579 PRIMARY AND SECONDARY SCLEROSING CHOLANGITIS. *(Ger.)*

Hahnloser, P.; Forrer, P.; Knoblauch, M. (Canton. Hosp., Zurich, Switzerland). *Helv. Chir. Acta* 41(5/6):691-698, 1974.

A case of primary sclerosing cholangitis in a 41-yr-old male patient is reported, and etiological and symptomological problems of primary and secondary sclerosing cholangitis are discussed. Recurrent lymphadenitis and bilateral sclerosis of the hili, axillary lymphadenitis, extrahepatic and intrahepatic sclerosis of the biliary ducts, jaundice, septic temperature, and obstruction of the right hepatic duct justified the diagnosis of primary sclerosing cholangitis against the background of multifocal sclerosis. Unlike secondary sclerosing cholangitis, primary sclerosing cholangitis continues to be of unknown etiology. It is impossible to distinguish between the pure form and that combined with other fibrotic diseases of equally unknown etiology, such as multifocal fibrosis, fibrosing mediastinitis, ulcerative colitis, Crohn's disease, or Riedel's goiter. Intermittent obstructive jaundice with or without septic temperatures is a common feature of primary and secondary sclerosing cholangitis. While secondary forms can be corrected by removal of the biliary duct obstruction, primary forms usually progress into secondary biliary cirrhosis with suppurative hepatitis and coma despite adequate long-term drainage by biliodigestive distulization and long-term steroid and antibiotic therapy.

3580 FLATULENT DYSPEPSIA IN PATIENTS WITH GALLSTONES UNDERGOING CHOLECYSTECTOMY. *(E.)*

Kingston, R. D.; Windsor, C. W. O. (Worcester R. Infirm., England). *Br. J. Surg.* 62(3):231-233, 1975.

The incidence of flatulent dyspepsia and its relation to gallbladder function was studied in 100 consecutive patients (75 women, 25 men, aged 17-80 yr) with gallstones undergoing cholecystectomy. The follow-up was between 3 months and 3 yr. A patient was considered to have flatulent dyspepsia if 3 or more of the following symptoms were present consistently to a moderate or severe degree: repeated belching; feeling full after a normal-sized meal; inability to finish a normal sized meal; abdomen blown out so that clothes need to be loosened; burning discomfort in the epigastrium; burning discomfort in the chest; and vomiting or nausea. A combination of the last 3 symptoms only was not classified as flatulent dyspepsia. Thirty-three percent of patients suffered significant flatulent dyspepsia of whom 80% were cured or improved by operation. Pre- and postoperative gastric emptying times were measured in 15 patients: 5 flatulent dyspeptics who were cured by operation, 5 who were not cured, and 5 patients without symptoms of flatulent dyspepsia. There was no difference in gastric emptying times between patients with flatulent dyspepsia who were cured by operation and those who remained symptomatic. The symptoms of flatulent dyspepsia were correlated with the bacteriological findings of the bile taken from the gallbladder at operation. In the nondyspeptic group equal numbers of patients (13) had infected and noninfected bile. In the dyspeptic patients 8 had infected bile and 5 had sterile bile. Seven of 8 patients cured of the dyspepsia by operation had infected bile, while the bile was sterile in those whose symptoms remained. This suggests that infection within the gallbladder may be a factor in the causation of flatulent dyspepsia. Half of the nondyspeptic patients, however, had infected bile, indicating that it may be a matter of degree and a certain type or level of infection needing to be present before becoming significant in producing flatulent dyspepsia. The concept of a functioning gallbladder emptying infected bile into the duodenum producing an ileus with reflux of bile into the stomach appears to be a very possible cause of flatulent dyspepsia.

3581 PERIBILIARY FAT: A NEW ROENTGENOGRAPHIC FINDING. *(E.)*

Shaub, M. S.; Birnbaum,

W. W.; Meyers, H. I. (Univ. South. California Med. Cent., Los Angeles). *Am. J. Roentgenol. Radium Ther. Nucl. Med.* 123(2):330-337, 1975.

The roentgenographic appearance of peribiliary fat which is seen in the right upper quadrant in the area of the liver, adjacent to the bile ducts is described and illustrated. Fat adjacent to the bile ducts appeared roentgenographically either as branching or linear lucencies on plain films of the right upper quadrant or as lucencies adjacent to the bile ducts on i.v. cholangiograms or oral cholecystograms. This lucency was best seen adjacent to the common hepatic and the common bile duct. In some of the early cases seen by the authors, the fat caused lucencies which simulated gas to such a degree that it was considered as a primary diagnosis. The patients, however, had no discernible reason to have gas within the biliary tree. The biliary system was examined at numerous autopsies and it became apparent that fat normally occurs around the bile ducts up to their entrance into the liver. The quantity of fat was roughly proportional to the amount of fat present in the remainder of the subject's body. Thus, the findings of upper right quadrant lucencies due to peribiliary fat are seen roentgenographically most frequently in obese individuals. It was found that these lucencies could help in identifying, locating, and measuring the diameter of the common bile duct when it is only faintly visualized on an i.v. cholangiogram or when its anatomical course is atypical. A review of the literature showed no previous description of the roentgenographic appearance of peribiliary fat. It is suggested that the significance of these findings is that branching or linear right upper quadrant lucencies are not necessarily gas within the biliary or portal system but may be due to prominent peribiliary fat.

3582 LIVER AND PANCREAS SCANNING IN EXTRAHEPATIC OBSTRUCTIVE JAUNDICE (WITH SPECIAL REFERENCE TO TUMOURS OF THE BILE AND HEPATIC DUCTS). *(E.)*

Agnew, J. E.; James, O.; Bouchier, I. A. D. (R. Free Hosp., London, England). *Br. J. Radiol.* 48(567):190-199, 1975.

^{198}Au-gold colloid liver scans and ^{75}Se-selenomethionine pancreas scans in 72 patients with extrahepatic obstructive jaundice were assessed by blind marking to determine: 1) if there is a recognizable liver scan appearance in extrahepatic jaundice, whatever the cause; and 2) if combined liver and pancreas scanning can help to distinguish between carcinoma of the bile and hepatic ducts, pancreatic carcinoma, and nonmalignant extrahepatic biliary obstruction. Of the 72 patients, 25 had carcinoma of the bile or hepatic ducts, 30 had carcinoma of the pancreas with obstructive jaundice, and 17 had nonmalignant obstructive jaundice with normal pancreas. Their scans were compared with liver and pancreas scans from 20 control patients and liver scans from 33 patients with diffuse liver disease. Of the liver scans in extrahepatic obstructive jaundice, 56% showed a filling defect in the hilar region of the liver. This was most frequently seen in the most deeply jaundiced patients, and was reported in 80% of patients with a serum bilirubin greater than 15 mg/100 ml. Combined pancreas and liver scans could not always distinguish between different forms of extrahepatic obstructive jaundice. A normal pancreas scan, however, can virtually exclude a pancreatic carcinoma as the cause of obstructive jaundice. A pancreas scan showing severely reduced uptake favors a diagnosis of carcinoma of the pancreas or of the lower end of the common bile duct. A liver scan showing defective left lobe uptake coupled with a pancreas scan showing normal or only moderately reduced uptake suggests the diagnosis of a carcinoma of the hepatic ducts.

3583 ACUTE REVERSIBLE RENAL FAILURE IN PATIENTS WITH ACUTE CHOLECYSTITIS AND CHOLANGITIS.

(E.) Burden, R. P.; Ash, D. V.; Boyd, W. N.; Gray, J. G.; Aber, G. M. (North Staffordshire Med. Inst., Stoke-on-Trent, England). *Q. J. Med.* 44(173):65-77, 1975.

Renal function was assessed in 14 patients with acute cholecystitis and 2 patients with acute cholangitis in order to establish the incidence and nature of the renal involvement in these diseases. The patients (9 women and 7 men) ranged in age from 30-77 yr and none gave a history of renal disease or urinary tract symptoms. All patients were treated with ampicillin (1 g/day, p.o. or i.v.) and parenteral fluids when indicated. Transient elevations in serum bilirubin, alkaline phosphatase, and SGOT were seen in every case, but only 2 patients had elevated serum amylase concentrations. Liver function tests and serum amylases returned to normal limits within 3-15 days. Six patients had no evidence of renal impairment, 4 had modest elevations in their plasma urea and creatinine concentrations, and 6 had acute reversible renal failure; 3 patients in the latter category required peritoneal dialysis. There was no correlation between the initial plasma creatinine and bilirubin concentrations. All patients had transient polymorphonuclear leucocytosis, 4 showed a transient thrombocytosis, and 5 had thrombocytopenia and RBC fragmentation. Plasma fibrogen and serum fibrin degradation products were elevated in all 8 patients in whom they were measured; these concentrations returned to normal limits on recovery. Most blood cultures were negative for bacteria and all mid-stream urine specimens were sterile. Of 5 bile specimens examined, *E. coli* was isolated in 4 and *Klebsiella* was isolated in the 5th. Renal angiography in 2 patients showed arterial narrowing and occlusion with cortical artifacts. There was a high incidence of facial herpes simplex in the patients who developed renal failure. Conservative management of acute renal failure accompanying acute cholecystitis and cholangitis is advisable. In the patients studied, renal failure probably occurred as a result of intravascular coagulation triggered by hypovolemia, bacteremia, or concomitant pancreatitis.

3584 BILE-SALT GLUCURONIDES IN URINE: SHORT COMMUNICATION. *(E.)* Back, P.; Spaczynski, K.; Gerok, W. (Med. Clin., Univ. Freiburg, Germany). *Hoppe Seylers Z. Physiol. Chem.* 355(6):749-752, 1974.

Synthetic sulphate esters of bile acids, after undergoing solvolytic cleavage, were analyzed to determine whether glucuronide binding occurred in the bile acids prior to renal excretion. Bile acids were extracted from 100 ml of urine obtained from a jaundiced patient and analyzed using various procedures involving treatment with β-glucuronidase. The analytical data give evidence that bile acids are excreted into human urine not only as taurine- and/or glycine-conjugated compounds and as sulphate esters of conjugated derivatives, but also as glucuronides of free acids and of conjugated bile acids.

3585 SURGICAL PATHOLOGY OF THE GALLBLADDER AND BILIARY TRACT: RETROSPECTIVE STUDY OF 4363 CASES. *(Fr.)* Rigo, M.; Mosimann, R.; Ryncki, P.; Saegesser, F. (Dept. Surg., Univ. Lausanne, Switzerland). *Helv. Chir. Acta* 41(5/6):533-536, 1974.

3586 CHOLEDOCHOTOMY IN ELDERLY PATIENTS. *(Rus.)* Tetdoev, A. M.; Negrei, V. A. (S. M. Kirov Mil. Med. Acad., Leningrad, USSR). *Vestn. Khir.* 113 (9):13-18, 1974.

3587 INDICATIONS FOR SPHINCTEROTOMY. *(Fr.)* Roux, M. (no affil.). *Helv. Chir. Acta* 41(5/6):779-788, 1974.

3588 RESECTION OF THE CYST AND END-TO-SIDE ANASTOSOMIS OF THE HEPATIC DUCTS TO THE DUODENUM IN CONGENITAL CYSTIC DILATATION OF THE COMMON BILE DUCT. *(Fr.)* Grosdidier, J.; Boissel, P.; Richaume, B.; Baudesson, D. (no affil.). *J. Chir. (Paris)* 107(2):117-124, 1974.

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3590 ACUTE CHOLECYSTITIS. *(Ger.)* Rossetti, M. (Canton. Hosp., Basel, Switzerland). *Helv. Chir. Acta* 41(5/6):767-771, 1974.

3591 ACALCULOUS CHOLECYSTITIS. *(Ger.)* Dippon, R. (Canton Hosp., Aarau, Switzerland). *Helv. Chir. Acta* 41(5/6):763-766, 1974.

3592 SHOCK AS POSSIBLE TRIGGER MECHANISM IN ACUTE POSTOPERATIVE AND POSTTRAUMATIC CHOLECYSTITIS. *(Ger.)* Meissner, K. (Salzburg Prov. Health Inst., Salzburg, Austria). *Langenbecks Arch. Chir.* 336(1):25-33, 1974.

3593 COAGULATION AND ANTICOAGULATION SYSTEM OF THE BLOOD IN CHRONIC CHOLECYSTOANGIOCHOLITIS. *(Rus.)* Podobedov, V. B. (Kiev Med. Inst., USSR). *Vrach. Delo* (11):63-66, 1974.

3594 CARDIAC SYNDROME BEFORE AND AFTER SURGICAL TREATMENT OF CALCULOUS CHOLECYSTITIS. *(Rus.)* Panfilov, B. K. (Med. Fac., P. Lumumba Peoples Friendship Univ., Moscow, USSR). *Vrach. Delo* (11):71-74, 1974.

3595 SHORT-TERM RESULTS OF SURGICAL TREATMENT FOR ACUTE CHOLECYSTITIS. *(Rus.)* Rodionov, V. V.; Moguchev, V. M.; Prikupets, V. L.; Sizemov, O. D. (Moscow Inst. Med. Stomatol., USSR). *Vestn. Khir.* 113(10):49-53, 1974.

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3604 CHOLEDOCHOLITHIASIS FOLLOWING DUODENOPANCREATECTOMY. *(Fr.)* Bessot, M.; Voiry, J. P.; Lorenzi, C.; Ravey, M.; Frisch, R. (Univ. Hosp. Cent., Nancy, France). *Ann. Med. Nancy* 13:1451-1454, 1974.

3605 BILE STONES AND INTESTINAL BY-PASS. *(Fr.)* Rautureau, M.; Coste, T.; Rautureau, J.; Paraf, A.; Gouffier, E. (Franco-Musulman Hosp., Bobigny, France). *Arch. Fr. Mal. App. Dig.* 63(5): 401-406, 1974.

3606 FORMATION AND EXCRETION OF BILE ACID SULFATES: AN IMPORTANT DEFENSE MECHANISM IN CHOLESTASIS. *(Ger.)* Stiehl, A. (Med. Clin., Univ. Heidelberg, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:948-950, 1973.

3607 MATHEMATICAL AND STATISTICAL ANALYSIS OF LABORATORY DATA IN CHOLESTASIS. *(Ger.)* Linhart, P.; Erbe, R.; Kommerell, B.; Papenberg, J. (Med. Clin., Heidelberg Univ., Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:967-969, 1973.

3608 RELAPSING CHOLESTASIS FOLLOWING USE OF ANTI-OVULATORY DRUGS IN PRIMARY SCLEROSING CHOLANGITIS. *(Ger.)* Hartmann, W.; Goebell, H.; Beneke, G.; Ruhle, K. H. (Cent. Intern. Med., Univ. Ulm, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:964-967, 1973.

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3643 OPERATIVE CHOLANGIOGRAPHY. PRESENT STATUS. *(E.)* Schulenburg, C. A. R. (Dep. Surg. Univ. Pretoria, South Africa). *S. Afr. J. Surg.* 12 (4):183-187, 1974.

3644 ENDOSCOPIC SPHINCTEROTOMY OF THE AMPULLA OF VATER. *(E.)* Kawai, K.; Nakajuma, M.; Kimoto, K.; Sugawara, K.; Fukumoto, K. (Kyoto Prefect. Univ. Med., Japan). *Endoscopy* 7(1):30-35, 1975.

3645 RADIOMANOMETRY OF THE BILIARY TRACT. *(Sp.)* Cassola Santana, J. R.; Alvare Gomez, C.; Arencibia Menendez, F.; Paez del Amo, N.; Rocabruna Pedroso, R.; Olivera Madrazo, A. (Martires del 9 de abril Reg. Hosp., Sagua la Grande, Las Villas, Cuba). *Rev. Cub. Cir.* 13(5):517-537, 1974.

3646 DUODENOSCOPIC CHOLANGIOGRAPHY AS A METHOD FOR POSTOPERATIVE EXAMINATION OF SIDE-TO-SIDE CHOLEDOCHODUODENOSTOMIES. *(Sp.)* Pardo Gomez, G.; Llanio Navarro, R.; Manso, E.; Collado Canto, E.; Monzon Etcheverry, J. A.; Rodriguez Sotello, P.; Montejo Viamonte, N.; Calleja Mcurelle, C.; Arencibia Horta, C. (Med. Sch., Univ. Havana, Cuba). *Rev. Cub. Cir.* 13(5):539-544, 1974.

3647 BILIARY TRACT DIAGNOSIS DURING SURGERY. (Ger.) Horntrich, J.; Keuntje, H.; Teutsch, W. (Reg. Hosp., Cottbus, Germany). *Zentralbl. Chir.* 99(31):972-977, 1974.

3648 HEMATOBILIA AS THE CAUSE OF GASTROINTESTINAL BLEEDING. *(Ger.)* Hamann, H. J.; Roding, H.; Struck, F. (Potsdam Reg. Hosp., Germany). *Zentralbl. Chir.* 99(37):1175-1178, 1974.

3649 PERFORATION OF THE GALLBLADDER IN ASSOCIATION WITH ACUTE PERFORATED DUODENAL STRESS ULCER. *(E.)* Johnston, P. W. (Univ. South. California, Pasadena). *J. Pediatr. Surg.* 10(2):283-284, 1975.

See also, 2506, 2599, 2609, 2700, 2767, 2871, 2872, 2873, 2880, 2907, 2908, 2909, 2910, 2912, 2913, 2915, 2916, 2917, 2918, 2922, 2926, 2935, 2942, 2949, 2950, 2952, 2953, 2962, 3129, 3130, 3163, 3170, 3319, 3320, 3329, 3335, 3340, 3345, 3359, 3365, 3387, 3388, 3406, 3408, 3418, 3523, 3538, 3704, 3753, 3764, 3784.

GENERAL

3650 PEUTZ-JEGHERS SYNDROME: ITS NATURAL COURSE AND MANAGEMENT. *(E.)* Utsunomiya, J.; Gocho, H.; Miyanaga, T.; Hamaguchi, E.; Kashimure, A.; Aoki, N.; Komatsu, I. (Sch. Med., Tokyo Med. Dent. Univ., Japan). *Johns Hopkins Med. J.* 136(2):71-82, 1975.

A total of 102 patients with Peutz-Jeghers syndrome were part of a follow-up study. The average age at diagnosis differed little between the sexes, 23 yr for males and 26 yr for females. However, the age distribution curve showed a clustering of males at younger ages. The male:female ratio was 1:1.13. Presenting symptoms included obstruction in 42.8% of the cases, abdominal pain in 23.4%, bloody stool in 13.5%, and anal extrusion of the polyp in 7.2%. The remaining 23.4% were diagnosed primarily because of melanin pigmentation. The most serious complication, intussusception, occurred in 105 cases, mostly in the small intestine (95.2% of the cases). Polyps were detected in 195 of the 222 recorded cases (those for which clinical data was available). The polyps occurred throughout the digestive tract, with the exception of the esophagus. Malignant changes of the polyps were histologically confirmed in 28 cases; including 15 examples of early cancer and 11 of advanced cancer. Although a diagnosis of advanced cancer in the Peutz-Jeghers syndrome does not necessarily indicate that it developed in a polyp, it is noted that many instances of advanced cancer in various parts of the gastrointestinal tract occurred in the present series. Melanin spots were located in the lips or perioral region (94.1%), the buccal mucosa (65.8%), and distal portion of the limbs (73.9% in the upper and 62.2% in the lower extremities) with additional spots in other locations in 21.2% of the examined cases. Of the 102 follow-up cases, 36 were known to have died. Of those who died before age 30, 42.9% were due to polyposis; death occurring after age 30 was attributed to neoplastic disease in about 60% of the cases. Affected parents were found in 57 cases. In one case an affected sibling was found, but diagnosis was not established in either parent. Thus the 58 familial cases amounted to 45.7% of the 127 affected individuals whose family histories were ascertained. Conservative treatment is recommended. If operative measures are necessary, injury to intestinal mucosa should be as limited as possible. If intussusception occurs in the small intestine, polypectomy is mandatory. Polyps in the stomach do not usually produce acute complications. Polyps of the large intestine, though rarely causing intussusception, may cause continuous bleeding in which case fiberscopic polypectomy is useful. If the patient is over 30 yr old, and the polyps are numerous, subtotal colectomy with cecoproctostomy may be carried out due to the high risk for cancer. The results of this study allow the conclusion that persons with the Peutz-Jeghers syndrome are at increased risk for cancer development, particularly cancer of the colon.

3651 ABDOMINAL ACTINOMYCOSIS. *(Fr.)* Mousseau, P. A.; Mousseau-Brodu, M. C. (Hotel Dieu, Nantes, France). *J. Chir. (Paris)* 106(6):565-588, 1973.

Case reports are presented for 4 patients with abdominal actinomycosis, and the 124 documented cases which have appeared in the literature since 1850 are reviewed. A 67-yr-old farm woman and a 60-yr-old cook underwent surgery for suspected cancer of the colon. However, examination of material obtained from a right hemicolectomy, performed on the first patient, showed an amyloid mass, 4 cm in diameter, in the cecum and ascending colon. The peritoneum was hypertrophied and fibrous and contained scattered foci of inflammation surrounded by sulfur granules. The second patient underwent extensive resection of the transverse colon and a loop of small intestine adhering to the tumor. On pathological examination, the tumor proved to be a thickened mucosal infiltration 3 cm long. The mesocolon and mesentery contained scattered necrotic abscesses surrounded by sulfur granules; these abscesses had penetrated the walls of the colon and small intestine. Another patient with actinomycosis of the small intestine had suppurating peritonitis due to perforation of a tumor the size of a potato; perforation was due to an ulcerative process. In serosal exudate there was a microabscess surrounded by a dark mass suggestive of *Actinomyces*. All 3 of these patients recovered uneventfully after removal of the lesion and antibiotic therapy. A 40-yr-old farm worker with a mass in the right iliac fossa proved to have an "anthracoid" abscess between the liver and colon at laparotomy. This was shown to result from an *Actinomyces* infection. The patients recovered after drainage of the abscess and antibiotic therapy.

3652 ACUTE NECROTIZING ENTEROCOLITIS IN INFANCY: A REVIEW OF 64 CASES. *(E.)* Santulli, T. V.; Schullinger, J. N.; Heird, W. C.; Gongaware, R. D.; Wigger, J.; Barlow, B.; Blanc, W. A.; Berdon, W. E. (Coll. Physicians Surg., Columbia Univ., New York, N.Y.). *Pediatrics* 55(3):376-387, 1975.

Clinical experience with 64 patients (35 girls and 29 boys) seen over a 20-yr period with acute necrotizing enterocolitis in infancy was reviewed. Of the 64 patients, 47 were born prematurely (73%). Diagnosis was based on tissue examination in 57 and on clinical syndrome, including pneumatosis, in 7. It is suggested that there are different gradations of this disease and that a much larger number of infants are seen and treated before developing the complete syndrome. Three factors are important in the development of the disease: injury to the intestinal mucosa; the presence of intestinal bacteria; and feedings (as a substrate for the bacteria). The importance of stress in the pathogenesis of the disease is confirmed by the high incidence of perinatal complications, particularly hypoxia. It was felt that indirect injury to the mucosa on the basis of selective mesenteric ischemia in response to stress was more important than direct injury to the mucosa from hyperosmolar feedings. Six of 37 patients treated medically survived. Their management included nasogastric decompression, i.v. fluid therapy, attention to acid-base and electrolyte balance, parenteral broad-spectrum antibiotics, frequent physical examination, and roentgenographic studies every 4 hr to detect pneumoperitoneum. Operations were performed on 27 patients; 8 survived. Indications for operation were pneumoperitoneum, peritonitis, and intestinal obstruction. Overall survival rate was 14 of 64 patients (22%). Survival was 16% without and 30% with operation. The preferred procedure is resection of all involved portions of bowel with a proximal enterostomy (chimney) type of side-to-end anastomosis, or resection with double enterostomy when the former is not feasible. The current plan of management requires immediate cessation of oral or gavage feedings, institution of nasogastric tube suction and administration of appropriate i.v. fluids. Parenteral antibiotics are given, usually ampicillin (150 mg/kg/24 hr). Topical antibiotics are administered by gavage at one or two times the parenteral dose of kanamycin or gentamycin/day in 6 divided doses. Low molecular weight dextran 40 is given i.v. in 10% solution, 10 mg/kg every 6 hr for 48 hr. Supine and left side down decubitus x-ray films are taken every 4 to 6 hr to detect unrecognized pneumoperitoneum or peritoneal fluid, and the infant is examined frequently for localized peritonitis. Any of these changes indicates surgery. Of the last 10 patients so treated, only one was operated on and she survived. Of the nine not operated on, four survived.

3653 FACTORS AFFECTING BILE ACID METABOLISM IN CHOLERRHEIC ENTEROPATHY.

(E.) Mitchell, W. D.; Findlay, J. M.; Macrae, R.; Eastwood, M. A.; Anderson, R. (Univ. Dep. Med., Edinburgh, Scotland). *Digestion* 11(1/2):135-146, 1974.

Fecal bile acid excretion and mouth to anus transit time were measured in 10 normal subjects and 9 patients (4 females and 5 males, aged 32-78 yr) with cholerrheic enteropathy. Bacteriological examination of the feces was carried out. All patients had ileal resections of varying lengths and had diarrhea. There was a significant increase in daily fecal weight and total bile acid excretion in feces of patients compared to normal subjects. There was also a marked difference in the pattern of bile acids excreted. Diarrheal patients excreted mainly 3,7-disubstituted (chenodeoxycholic acid) and 3,7,12-trisubstituted (cholic acid) bile acids whereas normal subjects excreted only 3-monosubstituted (lithocholic acid) and 3,12-disubstituted (deoxycholic acid) bile acids. The transit time in patients with ileal resection (mean 36.1 hr) was shorter than controls (mean 54.5 hr.). The concentration of bile acids in the stool from patients with ileal resection diarrhea was 3-4 times more than that for normal individuals, 16.4 *versus* 4.9 mM. There was no significant difference in the type and number of microorganisms occurring in the feces of the two groups. The pH of the fecal homogenate remained constant at pH 7 even after anaerobic incubation for 48 hr, thus explaining why no significant change in bacterial counts were observed after incubation with high concentrations of bile acids. The effect of altering the concentration of sodium taurocholate, sodium glycocholate and sodium taurochenodeoxycholate on the deconjugation and 7α-dehydroxylation of these bile acids by a fecal homogenate from a normal subject was also studied. There was no evidence of inhibition of deconjugation at concentrations as high as 15 mM. However, there was progressive inhibition of 7α-dehydroxylation at 24 and 48 hr with increasing concentration of bile acids, and at 10 mM and above, there was complete inhibition. Deconjugation of bile acid conjugates was normally complete between 6 and 12 hr. It was only after 24 hr that appreciable 7α-dehydroxylation occurred. These results support earlier findings that the major initial reaction in the catabolism of bile salts by intestinal bacteria is hydrolysis of the amide link. It is concluded that the presence of primary bile acids in the stool of patients with ileal resection can be explained by the inhibitory effect of bile acids at concentrations of more than 15 mM. At bile concentrations of less than 15 mM, transit time becomes relevant to 7α-dehydroxylation by fecal microorganisms.

3654 SERUM α-FETOPROTEIN IN PATIENTS WITH NEOPLASMS OF THE GASTROINTESTINAL TRACT.

(E.) McIntire, K. R.; Waldmann, T. A.; Moertel, C. G.; Go, V. L. W. (Natl. Cancer Inst., Bethesda, Md.). *Cancer Res.* 35(4):991-996, 1975.

Serum α-fetoprotein (AFP) levels were measured by a double-antibody radioimmunoassay technique in 580 patients with a variety of malignant and nonmalignant gastrointestinal diseases to determine the incidence of levels elevated above 40 ng/ml. Serum samples from 180 normal adults and 20 normal children (1-10 yr of age) were measured and the AFP levels were all less than 40 ng/ml. Elevated AFP levels were demonstrated in 24% of 45 patients with pancreatic carcinoma, 25% of eight patients with biliary tract carcinoma, 15% of 95 patients with gastric carcinoma, 3% of 191 patients with colorectal carcinoma, and 70% of 73 patients with primary liver carcinoma.

3655 SUBPOPULATIONS OF THYMUS DEPENDENT AND THYMUS INDEPENDENT LYMPHOCYTES IN HUMAN GUT ASSOCIATED LYMPHOID TISSUES.

(E.) Mavligit, G. M.; Jubert, A.; Gutterman, J. U.; Reed, R. C.; Hersh, E. M. (M. D. Anderson Hosp. Tumor Inst., Houston, Texas). *Surg. Gynecol. Obstet.* 140(3):397-400, 1975.

The proportions of thymus independent and thymus dependent cells in the human appendix and terminal portion of the ileum were studied using immunofluorescence and by rosette formation techniques. Lymphoid tissues from the appendix, terminal ileum, and mesenteric lymph nodes were obtained from two patients undergoing subtotal colectomy (one had Gardner's syndrome and the other had multiple familial polyposis). Spontaneous rosette formation with sheep erythrocytes (E-rosettes) was used to determine thymus dependent lymphocytes. Rosette formation with sheep erythrocytes coated with anti-sheep red blood cells antibody and complement (EAC-rosettes) was used to determine thymus independent lymphocytes. Direct immunofluorescence was also used to determine thymus independent lymphocytes. In the first patient, the appendix and terminal ileum both contained substantial numbers of thymus dependent and independent lymphocytes in almost equal proportions. The rosette formation technique showed a higher percentage of thymus independent cells than did the immunofluorescence technique. In the second patient, only the appendix was available for study but it showed both types of lymphocytes. In lymphocytes from all tissues studied, the predominant surface-bound immunoglobulin was IgM. Thus it was shown that both thymus independent and thymus dependent lymphocytes were present in human gut associated lymphoid tissues.
Of 14 patients with esophageal or small-bowel carcinoma, none had elevated serum AFP levels. Only 1% of 154 patients with nonmalignant, nonhepatic gastrointestinal disease had elevations of AFP. There was a significant elevation of AFP in patients with gastrointestinal neoplasia and the incidence of elevation was dependent upon the site of origin. Patients with carcinoma of the pancreas, biliary tract, and stomach had a greater incidence of elevations than those with carcinoma of the colon, esophagus, or small bowel. The authors suggest that serum α-fetoprotein may or may not be a useful marker for early diagnosis of gastrointestinal cancer, but for patients with advanced cancer, it could act as a marker to indicate the extent of the disease.

3656 SECRETORY AND SERUM IgA IN CHILDREN WITH PROTEIN-CALORIE MALNUTRITION.

(E.) Sirisinha, S.; Suskind, R.; Edelman, R.; Asvapaka, C.;

Olson, R. E. (Dep. Microbiol., Fac. Sci., Mahidol Univ., Bangkok, Thailand). *Pediatrics* 55(2):166-170, 1975.

Secretory immunoglobulin A (IgA) levels of children with protein-calorie malnutrition were measured on admission and during dietary treatment. Twenty-four children aged 1-5 yr had either marasmus (7), marasmus-kwashiorkor (9), or kwashiorkor (8). A majority were judged to have bacterial infections by clinical impression, leukocyte counts, chest x-ray, and blood and stool cultures. Normal well nourished children from the same area served as controls. IgG, and secretory IgA concentrations in nasal washings were determined by electroimmunodiffusion. Secretory IgA concentrations were significantly lower (16.1%) than control values (24.3%) and total serum protein, IgG and albumin were slightly reduced. These values remained substantially the same for days 1-70, but values from days 71-84 were not significantly different from control values. There was no correlation between the values and the 3 different clinical states of the children. Serum IgA was significantly higher in the malnourished children at admission than after dietary treatment, but no secretory component was present and no correlation existed between IgA values for serum and nasal washings. It is concluded that protein-calorie malnutrition results in a small but significant deficiency in secretory IgA, but this probably does not account for susceptibility of these children to infection.

3657 HISTOCOMPATIBILITY ANTIGENS AND SOLID MALIGNANT NEOPLASMS. *(E.)* Tarpley, J. L.; Chretien, P. B.; Rogentine, Jr., G. N.; Twomey, P. L.; Dellon, A. L. (Natl. Cancer Inst., Bethesda, Md.). *Arch. Surg.* 110(3):269-271, 1975.

The relation between histocompatibility antigen phenotypes and solid malignant neoplasms was studied in 633 cancer patients and compared with 489 normal controls by human lymphocyte antigen (HL-A) typing. HL-A typing for 21 specificities was performed by standard microcytotoxicity method. HL-A frequencies were compared using chi-square analysis employing 2 x 2 tables. HL-A8 was elevated in patients with squamous cancer, melanoma, and adenocarcinoma, with the highest incidence in those with salivary gland adenocarcinoma (67% as compared to 17% in controls). A threefold increase in HL-A5 occurred in patients with connective tissue sarcomas (28% as compared to 9% in controls). The patients were studied at varying intervals from time of diagnosis and treatment. Antigen frequencies did not vary when analyzed by time of diagnosis or interval after treatment, thus there was no correlation with survival. The results suggested that certain malignant neoplasms are associated with increased frequency of individual HL-A antigens, and this may give clues to cause and genesis for these tumors.

3658 INFLAMMATION OF THE INTESTINAL MUCOSA AND IMMUNOGLOBULIN PRODUCTION. *(Fr.)* Fodor, O.; Dumitrascu, D.; Radu, D.; Dejica, D.; Grigorescu, M. (3rd Med. Clin., Cluj, Rumania). *Ann. Gastroenterol. Hepatol. (Paris)* 10(5):377-387, 1974.

Immunoglobulins were determined quantitatively by radial immunodiffusion in the jejunal contents of 30 patients with chronic nonspecific enteropathies and the density of plasma cells containing the various types of immunoglobulins was studied by using the direct immunofluorescence technique on frozen or paraffin-embedded sections from the rectal mucosa of 18 patients with ulcerative colitis. In chronic nonspecific enteropathies, intraluminal IgA concentrations were significantly decreased in patients whose jejunal contents contained bacteria; this implies that there is a local immune deficiency. Significant decreases in intraluminal IgA concentrations were also detected in patients with inflammatory changes in the jejunal mucosa. Although IgG and IgM levels exhibited considerable individual variation with no apparent pattern, the sum of IgG and IgM concentrations was correlated with IgD and IgA concentrations, indicating that common immune effects were exerted on local immunoglobulins (IgA) and on the serum types (IgG and IgM). The mean serum IgA concentrations were increased in this group of patients, and the highest concentrations of IgA were found in patients with bacteria in the jejunal contents. In patients with ulcerative colitis, all of whom were in remission, the density of plasma cells containing IgA was decreased in the villous mucosa. No IgA was found at the apical pole of glandular cells in severe forms of ulcerative colitis and acute bacillary dysentery. A large number of cells containing IgE were detected in many cases. The number of cells containing IgG, IgM, and IgD was within normal limits.

3659 EFFECT OF LACTOSE-INDUCED DIARRHOEA ON ABSORPTION OF NITROGEN AND FAT. *(E.)* Bowie, M. D. (Dept. Pediatr., Univ. Cape Town, Rondebosch, South Africa). *Arch. Dis. Child.* 50(5):363-366, 1975.

The absorption of fat and the absorption and retention of nitrogen were studied in 20 children with kwashiorkor. Thirteen of the children showed marked variation of stool weight, stool lactic acid content, and stool sugar on being changed from milk to disaccharide-free diet and back again. These children had severe diarrhea while on milk. Lactose malabsorption in this group (nonabsorbers) was confirmed by abnormal lactose tolerance tests and low or absent small intestine mucosal lactase enzyme assay. Seven children (absorbers showed little variation in stool weight and lactic acid content, and satisfactory lactose absorption. Fa absorption was not affected by lactose-induced diarrhe but nitrogen absorption was impaired. In the nonabsorbers, nitrogen absorption dropped significantly upo reintroduction of milk feeds and reccurrence of diarrhea. Mean stool nitrogen during two periods of lactose-induced diarrhea was 1.14 g and 1.38 g/day. Nitrogen retention in these children was unaffected, and it is concluded that milk and milk products should continue to be used in programs to eliminate malnutrition

3660 CLINICAL AND IMMUNOLOGICAL ASPECTS OF PROTIEN-LOSING GASTROENTEROPATHY. *(Ger.)* Asakura, H.; Morishita, T.; Morita, A.; Hibi, T.; Ono, A.; Tsuchiya, M. (Sch. Med., Keio Univ., Tokyo, Japan). *Leber Magen Darm* 4(3):109-116, 1974.

Of 24 patients sith protein-losing enteropathy, confirmed by the Gordon test using ^{131}I-polyvinylpyrrolidone, six had intestinal lymphangiectasia; five multiple nonspecific ulcers of the small intestine; three each, Menetrier's disease and ulcerative colitis; two, constrictive pericarditis; and one each, stomach cancer, lymphoid hyperplasia of the small intestine, polyposis of the colon, neuroblastoma with retroperitoneal metastases, and transitory intestinal protein loss. Total serum protein concentrations ranged from 3.0 to 6.6 g/100 ml and serum albumin values, from 1.6 to 4.3 g/100 ml. A significant negative correlation between serum albumin concentrations and the rate of albumin degradation was found in this group of patients, while significant positive correlations were obtained in 17 patients with chronic liver disease and five with intestinal malabsorption. IgG concentrations were decreased in 16 and IgA concentrations, in 14 of these 24 patients with protein-losing enteropathies; one patient with multiple nonspecific ulcers of the ileum had an IgA level increased to 420 mg/100 ml. About half of the patients had decreased IgM concentrations. A correlation between immunoglobulin levels and immunoglobulin-secreting cell populations in the jejunal mucosa was found in only two of the seven patients investigated. In patients with intestinal lymphangiectasia, there was a decrease in the number of cells secreting all three types of immunoglobulins; the IgG and IgA populations were normal and the number of IgG-secreting cells was slightly increased in one patient with Menetrier's disease. After a patient with nonspecific ulcers of the small intestine and massive protein losses underwent ileal resection, the number of cells secreting IgA decreased significantly while serum albumin and IgG concentrations normalized. The late type of skin reaction occurred in only three of nine patients with the Mantoux test and in only one of eight with the dinitrochlorobenzene test. Lymphocyte cultures were transformed by phytohemagglutinin in three patients with intestinal lymphangiectasia, Menetrier's disease, and ulcers of the small intestine, resp., and T-cell populations proved to be normal in all five patients investigated.

3661 CELL RENEWAL OF GASTRIC MUCOSA IN ZOLLINGER-ELLISON SYNDROME. *(E.)* Castrup, H. J.; Fuchs, K.; Peiper, H. J. (Dep. Gen. Surg., Univ. Gottingen, Germany). *Acta Hepatogastroenterol. (Stuttg.)* 22(1):40-43, 1975.

The growth of the gastric mucosal cells was studied in 3 patients with Zollinger-Ellison syndrome by an *in vitro* autoradiographic method. Biopsies of 11 volunteers without pathological changes of the stomach served as controls. For the *in vitro* autoradiographic investigations the double-labeling technique with ^{3}H-thymidine was used. Quantitation of the different labeled cells and determination of the ^{3}H-index in the proliferation zone of the deeper portion of the gastric pits permitted the calculation of the DNA synthesis phase and the mean generation time. Histological examinations were also done to determine mucosal thickness and mean number of parietal cells/fundic gland. In the 3 patients with Zollinger-Ellison syndrome, the fundic gastric mucosa was thickened with a marked increase of the specific glandular cells. The autoradiographic examination showed a significant increase in proliferation of the stomach epithelial cells; the mean generation time was decreased from 72 hr (controls) to 45 hr (patients). The labeling index was increased from 10% (controls) to 15% (patients). The DNA synthesis, the G_2 phase, and the mitotic time were not changed. The results suggest that in Zollinger-Ellison syndrome, gastrin seems to have a trophic effect not only on the parietal and chief cells, but also on the cells of the surface epithelium of the stomach.

3662 RADIATION ENTERITIS IN CHILDREN: A RETROSPECTIVE REVIEW, CLINICOPATHOLOGIC CORRELATION, AND DIETARY MANAGEMENT. *(E.)* Donaldson, S. S.; Jundt, S.; Ricour, C.; Sarrazin, D.; Lemerle, J.; Schweisguth, O. (Pediatr. Radiother. Serv., Inst. Gustave-Roussy, Villejuif, France). *Cancer* 35(4):1167-1178, 1975.

Clinicopathologic observations and the method of management in 44 children with radiation enteritis were reviewed. All had received whole abdominal irradiation: 42 were treated by cobalt 60 teletherapy and 2 by 250-kV x-rays. Of the 44 children, 25 were given chemotherapy concomitantly with radiotherapy or within 1 month prior to the irradiation. Severe delayed radiation injury with small bowel obstruction occurred within 2 months after irradiation in 5 of 14 long-term survivors. Histologic appearance in the small bowel revealed severe villus blunting, lymphatic dilatation, and moderately dense inflammatory infiltrate. The 5 children were treated with a specific dietary regime free of gluten, free of protein from cow's milk and lactose, low in fat (0.5-1 g/kg/day), and low in residue. The diet was continued for 12-24 months, and gradual replacement to normal diet was well tolerated. The histologic appearance in the small bowel reverted to normal after dietary treatment. The rationale for the diet was that the histologic findings in the patients were suggestive of those seen in malabsorption from other causes; the continuous improvement in each patient suggests that the effects of the diet may be beneficial for radiation enteritis.

3663 TRAVELERS' DIARRHEA AND TOXIGENIC Escherichia coli. *(E.)* Gorbach, S. L; Kean, B. H.; Evans, D. G.; Evans, D. J.; Bessudo, D. (VA Hosp., Sepulveda, Calif.). *N. Engl. J. Med.* 292(18):933-936, 1975.

Travelers' diarrhea in Mexico was studied to determine the role of a heat-labile toxin-producing strain of *Escherichia coli*. A group of 133 US students were studied for 18 days after arriving in Mexico. Diarrhea developed in 29% after a mean time of 13 days. Heat-labile enterotoxin-producing *Escherichia coli* was found in the stools of 72% of sick and 15% of healthy students, none of whom had the pathogen when they entered Mexico. The incubation period was generally 24-48 hr and the carrier state was less than 5 days in 82% of students. *Entamoeba histolytica* was found in 6% of cases of diarrhea, but no salmonella, shigella, or penetrating *Escherichia coli*. The results suggest that approximately 70% of travelers' diarrhea in Mexico is associated with heat-labile toxigenic strains of *Escherichia coli*, and that the major source of contamination is probably the fecal-oral route.

3664 BENIGN FORM OF NECROTIZING ENTEROCOLITIS. *(E.)* Richmond, J. A.; Mikity, V. (USC Med. Cent., Los Angeles, Calif.). *Am. J. Roentgenol. Radium Ther. Nucl. Med.* 123(2):301-306, 1975.

The case histories and radiographic findings of 7 patients with a mild form of neonatal necrotizing enterocolitis are presented. The infants had comparatively mild clinical signs and symptoms related to the gastrointestinal tract; the radiographic findings included bowel dilatation, pneumatosis intestinalis, and portal venous gas. Significant bowel necrosis does not occur in the benign form of necrotizing enterocolitis. The etiology for the benign form of the disease is unknown but may be related to transient intestinal hypoxia; a benign prognosis may be suggested when pneumatosis intestinalis is present without bowel dilatation.

3665 GASTROINTESTINAL HISTOPLASMOSIS, ROENTGENOGRAPHIC, CLINICAL AND PATHOLOGICAL CORRELATION. *(E.)* Lee, K. R.; Lin, F. (Univ. Kansas Med. Cent., Kansas City). *Am. J. Gastroenterol.* 63(3): 255-265, 1975.

Five cases of gastrointestinal histoplasmosis were studied to correlate roentgenographic changes with clinicopathological findings. Physical examinations and barium studies were done on the 5 patients (3 males and 2 females aged 7-65 yr). When the pathological changes were correlated with the roentgenographic barium studies, 6 patterns of gastrointestinal histoplasmosis were identified: malabsorptive (edema, diffuse inflammatory infiltrates and shallow ulcers); ulcerative (larger and deeper ulcers); polypoid (nodular hyperplasia of the lymphoid follicles and dilated villi); granulomatous (intense and diffuse granulomatous infiltrates); tumefactive (large granulomas); compressive (enlarged mediastinal or mesenteric nodes). The clinical and radiological findings are varied, making the diagnosis of gastrointestinal histoplasmosis difficult; thus, it is suggested that histoplasmosis be included in the differential diagnosis of diseases presenting with a malabsorption pattern, gastrointestinal polyposis, ulcerative and granulomatous gastrointestinal diseases, and carcinoma, particularly with coexisting pulmonary lesions.

3666 A GENETIC STUDY OF LACTOSE DIGESTION IN NIGERIAN FAMILIES. *(E.)* Ransome-Kuti, O.; Kretchmer, N.; Johnson, J. D.; Gribble, J. T. (Univ. Coll. Hosp., Lagos, Nigeria). *Gastroenterology* 68 (3):431-436, 1975.

The ability to digest orally administered lactose was studied in 66 people (10 families) representing a number of Nigerian ethnic groups (European, Yoruba, Yoruba-European, Beni, Ibo, and Ibo-Yoruba-European). Samples of capillary blood were taken from fasting subjects at 0, 15, 30, and 60 min after ingestion of lactose (2 g/kg; maximum 100 g), and a rise in the blood glucose above 20 mg/100 ml defined the subject as a lactose digestor. Where both parents were unable to digest lactose, all of the progeny were lactose nondigestors. When one parent was a lactose digestor (European or Yoruba-European) and one a nondigestor, both types of progeny resulted, but the lactose digestors predominated (18 digestors compared to 11 nondigestors). There was no predominance of either sex or any suggestion of sex-linkage found in the study. The authors suggested that the ability to digest lactose was transmitted as an autosomal dominant gene and represents a mutated gene or a polymorphism. The results from this study and others suggest that the lactose nondigestor is homozygous, but it is impossible to determine whether the lactose digestor is heterozygous or homozygous for the genetic characteristic.

3667 LEUKAEMIC INFILTRATION OF THE GASTROINTESTINAL TRACT: AN UNUSUAL CAUSE OF PROTEIN-LOSING ENTEROPATHY. *(E.)* Cockington, R. A. (Adelaide Child. Hosp., Inc., Australia. *Med. J. Aust.* 1(627):103-105, 1975.

A male Caucasian, aged 5 yr and 4 months, with von Recklinghausen's disease and the juvenile type of chronic myeloid leukemia was studied. The patient presented with a 6 month history of lassitude, anorexia, weight loss, recurrent diarrhea, and increasing distension of the abdomen. The clinical signs included minor hepatosplenomegaly, generalized lymphadenopathy, non-specific papular skin eruptions. The differential leukocyte count revealed prominence of blasts and monocytes. Bone marrow showed myeloid hyperplasia and progressive thrombocytopenia. An increase in hemoglobin-F content in red blood cells was noted and persistent hypoproteinemia. Laparotomy showed dilated small bowel with gross granulation and ulceration of the mucosa, several pseudopolyps, and enlarged lymph nodes within the mesentery. Biopsy samples revealed infiltration of the liver, bowel, and lymph with leukemic cells of the myeloid series. Therapy was begun with 6-mercaptopurine after the diagnosis of chronic myeloid leukemia complicated with leukemic infiltration of the bowel was made. Terminally there was gastrointestinal bleeding and autopsy revealed lesions characteristic of chronic myeloid leukemia with infiltration of the gastrointestinal tract and lesions characteristic of von Recklinghausen's neurofibromatosis.

3668 STRUCTURE OF THE GASTRIC MUCOSA IN ACUTE INFECTIOUS NONBACTERIAL GASTROENTERITIS. *(E.)* Widerlite, L.; Trier, J. S.; Blacklow, N. R.; Schreiber, D. S. (Boston Univ. Med. Cent., Massachusetts). *Gastroenterology* 68(3):425-430, 1975.

The morphology of gastric fundal and gastric antral biopsies obtained serially from 15 normal adult male volunteers who ingested an inoculum containing Norwalk agent was studied. Gastric fundal and/or antral biopsies were obtained serially between 24 and 168 hr after administration of the stool filtrate containing Norwalk agent; base line biopsies were obtained prior to the administration of the agent. The biopsies were obtained p. o. with a multipurpose biopsy tube after an overnight fast. Clinical evidence of gastroenteritis with diarrhea and/or nausea and vomiting developed in nine of 15 subjects within 36 hr after the Norwalk agent was given. The other subjects remained asymptomatic. Gastric biopsies from those with normal base line biopsies remained normal during and after clinical illness, while those with mild to moderate gastritis in their base line biopsies showed persistence but no progression of the lesion during illness. Intestinal biopsies from four of the nine symptomatic subjects showed the typical enteritis lesion associated with this illness. Thus the acute infectious nonbacterial gastroenteritis induced by the Norwalk agent was not associated with a histologically detectable gastric mucosal lesion.

3669 ONCOCYTOMA (MITOCHONDRIOMA) OF THE PAROTID GLAND. AN ELECTRON MICROSCOPICAL STUDY. *(E.)* Sun, C. N.; White, H. J.; Thompson, B. W. (VA Hosp., Little Rock, Arkansas). *Arch. Pathol.* 99(4):208-214, 1975.

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See also, 2887, 2888, 2891, 2958, 2965, 3177, 3222, 3337, 3516, 3648.

GENERAL

Parasitology

3744 MORPHOLOGICAL CHANGES IN THE LIVER IN HEPATIC AMOEBIASIS. *(E.)* Ravi, V. V.; Tandon, H. D.; Tandon, B. N. (All-India Inst. Med. Sci., New Delhi). *Indian J. Med. Res.* 62(12):1832-1837, 1974.

A comparative study of morphological changes in the liver was undertaken in 17 patients with amebic liver abscess, 19 patients with non-suppurative hepatic amebiasis and four patients with asymptomatic hepatomegaly. Percutaneous liver biopsy was performed in all cases. Serum transaminases and serum alkaline phosphatase estimations were done, in addition to BSP retention, serum bilirubin, serum proteins, serum cholesterol, and serum total lipids. The indirect hemagglutination test for amebiasis was done in cases of non-suppurative hepatic amebiasis and cases of amebic liver abscess. The most significant changes in the histopathology of the liver away from the abscess site were regenerative changes in the form of increased anisonucleosis and binucleate cells. Kupffer cell hyperplasia, increased lipofuchsin pigment, portal and sinusoidal infiltration and occasional focal areas of necrosis were also seen. In non-suppurative hepatic amebiasis, the changes were mild and comprised aninucleosis and increased lipofuchsin pigment. No significant abnormality was observed in cases of asymptomatic hepatomegaly. Serum alkaline phosphatase was the most frequent abnormality found in the two disease groups. The indirect hemagglutination test for amebiasis was positive in 14 of 16 cases of amebic liver abscess and in 10 of 19 cases of non-suppurative hepatic amebiasis. The results confirmed earlier findings, and it is concluded that the morphological changes in hepatic amebiasis are non-specific. Regenerative reaction is suggested as the cause of hepatomegaly in non-suppurative hepatic amebiasis and for the diffuse hepatomegaly in amebic liver abscess.

3745 MUCOSAL SURFACE INJURY OF JEJUNAL MUCOSA IN PATIENTS WITH GIARDIASIS: AN ELECTRON MICROSCOPIC STUDY. *(E.)* Tandon, B. N.; Puri, B. K.; Gandhi, P. C.; Tewari, S. G. (All-India Inst. Med. Sci., New Delhi). *Indian J. Med. Res.* 62(12): 1838-1842, 1974.

An electron microscopic study of jejunal biopsy was made in 6 patients with *Giardia lamblia* infection to investigate the role of absorptive cell injury in the mechanism of malabsorption in giardiasis. The morphology of the jejunal mucosa was studied both by light and electron microscopy. Adherence of *G. lamblia* to the microvilli with an apparent decrease of the fuzzy coat and formation of large numbers of lamellated bodies was observed in 3 of 6 patients with steatorrhea. The three patients who had no absorptive function derangement did not show mucosal surface abnormalities. Invasion of the mucosa by the parasite was not observed. The mechanical barrier between the nutrients in the lumen and microvilli of the absorptive cells caused by the adherence of *G. lamblia* to the mucosal surface and the destruction of fuzzy coat are suggested as contributory factors to the mechanism of malabsorption syndrome in patients with giardiasis.

3746 HEPATIC BROMSULPHTHALEIN GLUTATHIONE CONJUGATING ENZYME IN AMOEBIC LIVER ABSCESS. *(E.)* Datta, D. V.; Singh, S.; Samanta, A.; Raidu, S.; Nirankari, O. P.; Chhutani, P. N. (Postgrad. Inst. Med. Educ. Res., Chandigarh, India). *Indian J. Med. Res.* 62(12):1897-1901, 1974.

Hepatic glutathione conjugating ability for BSP in affected and unaffected hepatic lobes in patients with amebic liver abscess was studied by a direct micromethod. The enzyme was measured in the affected lobe in 25 patients and in both the affected and unaffected lobe in 5 additional patients. The enzyme activity in the tissue samples from the affected lobe was significantly lower than that in controls (0.035 *versus* 0.120 mg/g liver/10 min), and the activity was not related to the presence of jaundice. Plasma BSP retention showed no significant correlation with hepatic enzyme activity. Liver biospy from affected lobes showed varying degree of necrosis and degeneration of parenchymal cells and chronic inflammatory cells. Unaffected lobes revealed normal enzyme activity and minimal nonspecific inflammatory changes in histology. The results suggest that impairment of hepatic BSP-glutathione conjugation may be a contributory factor in the pathogenesis of high plasma BSP retention in patients with amebic liver abscess. The low enzyme activity in the affected liver tissue may be related to the release of enzyme into circulation following hepatic damage.

3747 THE CHALLENGE OF INTESTINAL PARASITIC INFESTATIONS IN CHILDREN. *(E.)* Gupte, S. (H. P. Med. Hosp., Simla, India). *Indian Pract.* 27(8): 355-359, 1974.

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3756 AMOEBIC LIVER ABSCESS: WITH SPECIAL REFERENCE TO THERAPY WITH METRONIDAZOLE (FLAGYL). *(E.)* Agarwal, B. L.; Mukerji, M.; Misra, D. N. (M. L. N. Med. Coll., Allahabad, India). *Indian Pract.* 27(8):361-364, 1974.

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3758 Nippostrongylus brasiliensis: THE DISTRIBUTION OF PRIMARY WORM POPULATIONS WITHIN THE SMALL INTESTINE OF NEONATAL RATS. *(E.)* Jankins, D. C. (Res. Lab., May & Baker Ltd., Dagenham, England). *Parasitology* 68(3):339-345, 1974.

3759 LESION FORMATION IN THE LIVERS OF MICE CAUSED BY METABOLIC PRODUCTS OF Hymenolepis microstoma. *(E.)* Simpson, G. F.; Gleason, L. N. (Dep. Biol., West. Kentucky Univ., Bowling Green). *J. Parasitol.* 61(1):152-154, 1975.

3760 DIFFUSE SMALL BOWEL INVOLVEMENT IN MALIGNANT HISTIOCYTOSIS. *(E.)* Chawla, S. K.; Lopresti, P. A.; Burdman, D.; Sileo, A.; Govoni, A. F.; Smulewicz, J. J. (Queens Hosp. Cent., Jamaica, N.Y.). *Am. J. Gastroenterol.* 63(2):129-134, 1975.

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3767 REGULATION OF SPLEEN GROWTH AND PORTAL PRESSURE IN HEPATIC SCHISTOSOMIASIS. *(E.)* Dumont, A. E.; Becker, F. F.; Warren, K. S.; Martelli, A. B. (New York Univ. Sch. Med., N.Y.). *Am. J. Pathol.* 78(2):211-224, 1975.

3768 DERIVATIVES OF 1,3,4-THIADIZOLE AS POTENTIAL SCHISTOSOMICIDES. *(E.)* El-Dine, S. A. S.; Clauder, O. (Semmelweis Med. Univ., Budapest, Hungary). *Acta Chir. Acad. Sci. Hung.* 84(1):85-91, 1975.

3769 ANTHELMINTHIC EFFICACY OF DIOSPYROL AND ITS DERIVATIVES. *(E.)* Sen, H. G.; Joshi, B. S.; Parthasarathy, P. C.; Kamat, V. N. (Ciba Res. Cent., Bombay, India). *Arzneim. Forsch.* 24(12):2000-2003, 1974.

3770 AMOEBIC PERFORATIONS OF THE COLON. *(E.)* Mukerjee, S.; Nigam, M. (Lady Hardinge Med. Coll., New Delhi, India). *Am. J. Proctol.* 26 (2):57-66, 1975.

3771 AMOEBIC RECTAL BLEEDING IN CHILDREN. *(E.)* Kalani, B. P.; Sogani, K. C. (S.M.S. Med. Coll., Jaipur, India). *Am. J. Proctol.* 26(2):67-71, 1975.

3772 LIVER ABSCESS DUE TO AN ASCARID IN IRAN. *(E.)* Nagaty, H. F.; Hedayati, E.; Assassi, B. (Fac. Med., Univ. Tabriz, Iran). *Am. J. Trop. Med. Hyg.* 24(2):371-372, 1975.

3773 Hymenolepsis diminuta: EFFECT OF THE OXIDATION-REDUCTION POTENTIAL IN THE MAMMALIAN GASTROINTESTINAL CANAL. *(E.)* Mettrick, D. F. (Dep. Zool., Univ. Toronto, Canada). *Exp. Parasitol.* 37(2):223-232, 1975.

See also, 2865, 2870, 2933, 2934, 2936, 3128, 3378, 3381.

GENERAL

Regional Enteritis

3774 INDICES OF GRANULOCYTE ACTIVITY IN INFLAMMATORY BOWEL DISEASE. *(E.)* Kane, S. P.; Hoffbrand, A. V.; Neale, G. (R. Postgrad. Med. Sch., London, England). *Gut* 15(12):953-959, 1974.

A study of vitamin B_{12}-binding proteins and serum lysozyme in an unselected group of 23 patients with ulcerative colitis and 26 with Crohn's disease (aged 18-84 yr) was performed. Three groups of control subjects were used, 12 healthy persons (aged 18-42 yr), 17 patients (aged 20-72 yr) with diarrhea and abdominal pain not due to ulcerative colitis or Crohn's disease, and 10 patients (18-64 yr) with active rheumatoid arthritis. Normal controls had a mean serum vitamin B_{12} level of 423 pg/ml, whereas the 49 patients with inflammatory bowel disease had a mean of 462 pg/ml. This difference was not significant nor were differences in levels between ulcerative colitis and Crohn's disease patients. The 49 patients with inflammatory bowel disease had a mean total B_{12}-binding capacity of 2.85 ng/ml, while the mean in 12 normal subjects was 1.66 ng/ml, a highly significant difference. There was no significant difference between the mean total B_{12}-binding capacity of normal controls or patients with either non-inflammatory bowel disease or with rheumatoid arthritis. No significant difference was noted in total B_{12}-binding capacity between 23 patients with ulcerative colitis and 26 with Crohn's disease. The rise in serum unsaturated vitamin B_{12}-binding capacities and hence in total B_{12}-binding capacities in patients with inflammatory bowel disease appears largely due to a rise in the granulocyte-secreted binders, transcobalamins I and III, with no significant rise in transcobalamin II. The mean values of total B_{12}-binding capacities increase progressively with disease activity. Moreover, in 7 patients studied before and after treatment, there was a significant fall in total B_{12}-binding capacity as the disease remitted. In attempting to correlate total B_{12}-binding capacity with recognized indices of disease activity, no correlation was found with hemoglobin concentration, serum albumin, or ESR. However, there was a just significant correlation between total B_{12}-binding capacity and circulating granulocyte count. The mean serum lysozyme value in 21 patients with inflammatory bowel disease, 6.8 µg/ml, was significantly greater than the mean value of 5.1 µg/ml in 12 normal subjects. These results show that patients with inflammatory bowel disease frequently have raised levels of total serum vitamin B_{12}-binding capacity due primarily to increased concentrations of transcobalamins I and III. While total B_{12}-binding capacity correlated to some extent with disease activity, it correlated poorly with other established indices of disease activity.

3775 A HYPOTHESIS FOR THE PATHOGENESIS OF CROHN'S DISEASE BASED ON AN ULTRASTRUCTURAL STUDY. *(E.)* Cook, M. G.; Turnbull, G. J. (Dep. Exp. Pathol. Cancer Res., Univ. Leeds, England). *Virchows Arch. Pathol. Anat.* 365(4):327-336, 1975.

Sarcoid granuloma, the distinctive feature of Crohn's disease, has been studied in greater detail and in more cases with electron microscopy to assess the relative importance of factors stimulatory to granuloma formation. The tissue samples were taken from

10 patients (aged 16-63 yr) in whom the history of disease ranged from 4 months to 13 yr. The site of disease was the rectum (2), colon and rectum (1), colon (1), jejunum (1), and ileum (5). One had received no treatment. The others were treated with antibiotics alone (3), antibiotic and steroids (3), steroids alone (1), and antibiotics and sulphonamides (2). Two were classified as having very many granulomata, two with many granulomata, one with few granulomata, one with ill-defined granulomata with isolated giant cells, two with granulomata in the nodes only, and two with no granuloma. Results of this study indicate that in many respects the ultrastructure of Crohn's disease confirms the impression of light microscopy that the nonulcerated epithelium which appears normal on light microscopy shows no abnormalities of fine detail either. Nerve bundles are hypertrophied, but show no ultrastructural abnormalities, and neither do any of the cells of the inflammatory infiltrate. These observations apply to all case studies, including the two without granulomata. These latter two did show a proportion of plasma cells in between the low numbers of granlomatous Crohn's disease and the high numbers seen in ulcerative colitis. This may indicate a humoral response perhaps comparable to that in ulcerative colitis where there is evidence of autoimmune activity against the epithelium. The abundance of mast cells previously reported was apparent only in some of the diseased tissues. The endothelial thickening described earlier was not found. The granulomata in Crohn's disease were ultrastructurally similar to those seen in sarcoidosis and also resemble those produced in positive Kveim tests. The granulomata of an individual case of Crohn's disease show a uniform appearance in terms of vacuolation and pinocytosis, even in widely separated parts of the bowel. This, together with the gradation in the state of vacuolation in the series suggests a synchronized sequence of pinocytosis, vacuole formation and lysosomal activity. The pathogenesis of nongranulomatous forms of Crohn's disease is quite unclear, but there may be an autoimmune humoral element. Cell-mediated hypersensitivity probably stimulated by the episodic passage from the gut lumen of an exogenous antigen seems likely to be the important factor in the pathogenesis of granulomatous Crohn's disease.

3776 EXCISIONAL SURGERY WITH ILEOSTOMY FOR CROHN'S COLITIS WITH PARTICULAR REFERENCE TO FACTORS AFFECTING RECURRENCE.

(E.) Steinberg, D. M.; Allan, R. N.; Thompson, H.; Brooke, B. N.; Alexander-Williams, J.; Cooke, W. T. (Gen. Hosp., Birmingham, England). *Gut* 15(11):845-851, 1974.

The excision of the large intestine with ileostomy is reported in 73 patients (40 men and 33 women) with Crohn's colitis who have been followed for at least 9 year since resection. Sixty-four are still alive and all but two of them are in good health. The age range for onset of symptoms in men was 23-67 yr; in women, 11-40 yr. Continuous symptoms of diarrhea, abdominal pain, general malaise, and weight loss were seen in 42, while 29 ran a chronic intermittent course. Two presented with acute fulminating disease. A mean period of 6.1 yr occurred between onset of symptoms and excisional surgery with ileostomy. A previous bowel resection had been performed on 27. In 54 patients the disease involved the total colon and rectum; in seven, the total colon with rectal sparing; in nine, left side only; in one, right side only. A one-stage panproctocolectomy was the treatment for 36, while five had a two-stage procedure. Early in the series, 12 were treated by a temporary ileostomy followed by a panproctocolectomy. Seven had colectomy with ileostomy where the proximal rectum was exteriorized as a mucous fistula and three had a colectomy, ileo-rectal anastomosis and a defuctioning ileostomy. Ten were treated previously by ileo-rectal anastomosis and were submitted to excision of the rectum with ileostomy due to persistent diarrhea, general malaise, and perianal sepsis. The operative mortality rate was 4.1% (3 patients). In the first 4 weeks, 24 experienced ileostomy dysfunction. The commonest site of sepsis was the perianal wound after proctectomy, which occurred in 21 of 64 patients. Late mortality related to the disease was 7.1%, (5 of 70). During the follow-up period 45 (64%) of the 70 patients have been re-admitted on 96 occasions. Twenty-three had evidence of recurrence, 20 in the terminal ileum, 5 diffuse small bowel, 3 jejunal, and 1 gastric. Of these 23, 20 had undergone 26 resections. Four died after operation for recurrent disease. There was no significant difference in the risk of development of recurrence whether the ileum was involved or not. Considering only colonic involvement, those with left-sised disease (6 patients) all suffered recurrence more than 5 yr after surgery, while 15 of 17 with total colonic involvement recurred within 5 yr of ileostomy. The younger group had both an initially higher incidence of recurrence and a higher annual incidence subsequently. There was a trend toward a higher recurrence risk in patients with a shorter length of history before excisional surgery. The risk of recurrence was the same whether the operation was done as a one-stage panproctocolectomy or a multiple-stage procedure. Of the original 73 patients, 64 are still alive, including 19 of the 23 who had recurrent disease. All but one of these 19 are currently in good health. Of the other 45, only one is not well. Of the 64 survivors, 36 take supplements of potassium, iron, and folic acid, and 8 still receive steroid therapy. It is concluded that, unlike patients with ulcerative colitis, excisional surgery with ileostomy for Crohn's disease cannot guarantee a cure, but most patients remain in good health apart from a small group who experience transient episodes of ileostomy dysfunction.

3777 SPLIT ILEOSTOMY IN THE TREATMENT OF CROHN'S DISEASE OF THE COLON.

(E.) Lee, E. (Radcliffe Infirm., Oxford, England). *Ann. R. Coll. Surg. Engl.* 56(2):94-102, 1975.

A modification of the double-barrelled ileostomy is described for the treatment of Crohn's disease of the colon. A more conservative approach is suggested. The inflamed large bowel is defunctioned by an external diversionary ileostomy. Subsequent treatment includes topical and oral corticosteroids for 3 months. The bowel remains at rest for at least 1 yr, unless the disease progresses. If inflammation continues to progress or a complication develops, resection is undertaken as soon as the patient's general condition permits. Split ileostomy has been used to achieve healing, in cases where there is hope of restoring the continuity of the gut without resection after 12-18 months; to facilitate major resection, in patients requiring the operation but in poor general health; and to facilitate limited resection, in patients with diffuse disease one area of which had a complication requiring resection. There are few postoperative complications. Of 69 patients so treated, 22 have come to proctolectomy. Of the 46 treated to achieve healing, 14 have been closed (four of whom suffered recurrences, one died, and nine are well), 22 are awaiting closure, and 10 underwent proctolectomies for progressive disease. Of the 13 who underwent this procedure to facilitate major resection, nine had proctocolectomies, two were closed without resection, and two are awaiting resection. Of the 10 who underwent this procedure to facilitate limited resection, two were closed without resection, one developed a rectovaginal fistula which healed spontaneously, and seven underwent successful limited resections. The surgical technique and course of treat treatment described is effective in improving the patients' general condition and at the same time allowing the option of further treatment.

3778 FAMILIAL CROHN'S DISEASE: A REPORT OF FIVE CASES. *(Fr.)* Preel, J. L.; Hardouin, J. P.; Debray, C. (Louis Mourier Hosp., Colombes, France). *Arch. Fr. Mal. Dig.* 63:485-493, 1974.

3779 INCIDENCE OF CROHN'S DISEASE IN THE CITY OF MALMO. *(E.)* Wenckert, A.; Henricsson, A.; Lindstrom, C. (Gen. Hosp., Malmo, Sweden). *Scand. J. Gastroenterol.* 9(27):42, 1974.

3780 A CASE OF LESNIOWSKI-CROHN DISEASE. *(Pol.)* Zagorski, W.; Badowski, A.; Stanowski, E. (Acad. Med., Warsaw, Poland). *Wiad. Lek.* 27(6): 551-554, 1974.

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3783 DILATATION OF THE COLON COMPLICATING CROHN'S DISEASE: REVIEW OF THE LITERATURE WITH REGARD TO ONE CASE. *(Fr.)* Bousquet, O.; Malafosse, M.; Saigot, T.; Sarrazin, A.; Loygue, J. (Salpetriere Hosp., Paris, France). *Nouv. Presse Med.* 3(38/40):2497-2499, 1974.

3784 CHOLELITHIASIS IN CROHN'S DISEASE. *(Ger.)* Seiler, P.; Amman, R.; Lutolf, U.; Knoblauch, M.; Lammli, P.; Bihrer, R.; Fumagalli, I.; Leemann, A.; Stuby, K. (Dep. Intern. Med., Univ. Zurich, Switzerland). *Schweiz. Med. Wochenschr.* 104(26):927-929, 1974.

See also, 3290, 2392, 2396, 3301.

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PREFACE

GASTROENTEROLOGY ABSTRACTS and CITATIONS is a publication of the National Institute of Arthritis, Metabolism and Digestive Diseases. This specialized information medium has been initiated to fill an existing great need in the field of gastroenterology and to assist the Institute in meeting its obligations to foster and support laboratory and clinical research into the nature, causes, and therapy of diseases of the gastrointestinal tract. Publication GASTROENTEROLOGY ABSTRACTS and CITATIONS makes available citations of all current papers relevant to this field from medical journals published throughout the world. Approximately one-third of the citations dealing with the major aspects of gastroenterology have accompanying abstracts.

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The Secretary of the Department of Health, Education, and Welfare has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through April 30, 1975.

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NOTE

Journal names are abbreviated according to the list of abbreviations used by *Index Medicus*. For journals not covered by *Index Medicus*, the abbreviations (with some modifications) found in *World Medical Periodicals*, 3rd Edition, are used.

LANGUAGE ABBREVIATIONS

Afr.	Afrikaans
Ar.	Arabic
Bul.	Bulgarian
Ch.	Chinese
Cz.	Czech
Dan.	Danish
Dut.	Dutch
E.	English
Eston.	Estonian
Fin.	Finnish
Fl.	Flemish
Fr.	French
Ger.	German
Gr.	Greek
Heb.	Hebrew
Hun.	Hungarian
Ic.	Icelandic
In.	Indonesian
It.	Italian
Jap.	Japanese
Kor.	Korean
Latv.	Latvian
Lith.	Lithuanian
Nor.	Norwegian
Pol.	Polish
Por.	Portuguese
Rum.	Rumanian
Rus.	Russian
Ser.	Serbo-Croatian
Sl.	Slovak
Sp.	Spanish
Sw.	Swedish
Th.	Thai
Turk.	Turkish
Uk.	Ukrainian
Viet.	Vietnamese

ABBREVIATIONS USED IN ABSTRACTS

ACTH	adrenocorticotropic hormone
ADP	adenosine diphosphate
AMP	adenosine monophosphate
amp	ampere
ATP	adenosine triphosphate
Å	angstrom
BSP	sulfobromophthalein
C	degrees centigrade
cal	calories
cc	cubic centimeter
cm	centimeter(s)
dl	deciliter
DNA	deoxyribonucleic acid
ED$_{50}$	median effective dose(s)
EDTA	ethylenediamine tetraacetic acid
e.g.	for example
EEG	electroencephalogram
ESR	erythrocyte sedimentation rate
g	gram(s)
μg	microgram(s)
Hz	Herz
hr	hour(s)
i.m.	intramuscular
i.p.	intraperitoneal
IU	international unit(s)
i.v.	intravenous
kcal	kilocalorie(s)
kg	kilogram(s)
K$_m$	Michaelis constant
LD$_{50}$	median lethal dose(s)
LDH	lactic acid dehydrogenase
m	meter(s)
M	molar; mole(s)
mM	millimolar; millimole(s)
μM	micromolar; micromole(s)
ma	milliampere(s)
mCi, μCi	milli-, microcurie(s)
mEq	milliequivalent(s)
mg	milligram(s)
ml, μl	milli-, microliter(s)
mm	millimeter(s)
mOsm	milliosmolar; milliosmeter(s)
msec	millisecond(s)
mV	millivolt(s)
min	minute(s)
MTD	maximum tolerated dose
NAD	nicotanamide adenine dinucleotide
NADH	reduced nicotanamide adenine dinucleotide
NADP	nicotanamide adenine dinucleotidephosphate
NAPH	reduced nicotanamide adenine dinucleotidephosphate
ng	nanogram (10^{-9})
nm	nanometer(s)
Pa	ambient pressure
PAS	periodic acid — Schiff
pg	picogram (10^{-12})
pgEq	picogram equivalent(s)
p.o.	orally
ppb	parts per billion
ppm	parts per million
r	Roentgen
RBC	red blood cells (erythrocytes), red blood count
resp.	respectively
RNA	ribonucleic acid
s.c.	subcutaneous
sec	second(s)
SGOT	serum glutamic-oxalacetic transaminase
SGPT	serum glutamic-pyruvic transaminase
U	unit(s)
UV	ultraviolet
V	volt
WBC	white blood cells (leukocytes), white blood count
yr	year(s)

PRE-CLINICAL SCIENCES

MORPHOLOGY, CELLULAR STRUCTURE AND HISTOCHEMISTRY

3785 GROWTH-HORMONE RELEASE-INHIBITING HORMONE IN GASTROINTESTINAL AND PANCREATIC D CELLS.

(E.) Polak, J. M.; Grimelius, L.; Pearse, A. G. E.; Bloom, S. R.; Arimura, A. (R. Postgrad. Med. Sch., London, England). *Lancet* 1(7918):1220-1222, 1975.

To determine whether growth-hormone release-inhibiting hormone (GH-RIH) is present in endocrine cells outside of the hypothalamus, the upper gastrointestinal mucosa and pancreatic D cells of dogs, pigs, and humans were examined for hormone activity using combined immunocytochemical and histological methods. Cells specifically stained for GH-RIH were seen in all areas of the gastrointestinal mucosa examined, being predominantly localized in the midzone of the glands. The hormone-positive cells were lead-hematoxylin positive but negative with the Masson and Grimelius silver-impregnant techniques. GH-RIH cells were also seen in the human pancreatic islets; these cells corresponded to the argyrophil cells stained with the Hellerstrom-Hellman method for D (α_1) cells. The GH-RIH cells were negative for the Grimelius silver method, which stains the glucagon-producing A cells of the pancreas positively. The results suggest that in the gut, the D cell of the Wiesbaden classification is the most likely source of GH-RIH. They also suggest that GH-RIH may play an important role in digestive regulation.

3786 MORPHOLOGICAL INCONSISTENCY IN LIVER CELLS IN CULTURE.

(E.) Okigaki, T.; Quan, S. G. (Pasadena Found Med. Res., Calif.). *Proc. Jpn. Acad.* 50(7):517-520, 1974.

Morphological changes were studied in cultured rat hepatocytes. Livers from three 12-day-old Wistar rats were minced and dissociated with a mixture containing collagenase, hyaluronidase, and trypsin. A primary culture, grown for 2 weeks in Ham's F-12 medium with 10% fetal calf serum, showed a mixture of hepatocyte-like epithelial and non-epithelial cells. The non-epithelial cells were mechanically eliminated with a sharp pin, and a homogenous population of epithelial cells obtained by clonal isolation and/or treatment with hydrocortisone (20 mg/liter) containing medium. The cultures were studied by time lapse cinematography. Typical epithelial cells in early passages were observed to change their morphology in a relatively short period ot time. One line was not epithelial in morphology in later passages, and showed no liver specific response for tyrosine transaminase, but showed a weak positive reaction for tyrosine aminotransferase. This line had been grown in both arginine-free and hydrocortisone-containing media. Although lacking certain liver specific characteristics, it reacted to thioacetamide in the same manner as normal hepatocytes, with swelling and deformation of nucleoli. It is concluded that cultured liver cells can be classified as typical epithelial cells with liver specific characteristics, hepatocyte-derived near- or non-epithelial cells not retaining many characteristics, and non-epithelial non-hepatocytic cells from the beginning of cultivation.

3787 ULTRASTRUCTURE OF THE DEVELOPING FETAL HEPATOCYTE OF Macaca arctoides: A PROPOSED MODEL FOR STUDIES OF FETAL DRUG METABOLISM.

(E.) Quattropani, S. L.; Stenger, V. G.; Dvorchik, B. H. (Milton S. Hershey Med. Cent., Pennsylvania State Univ., Hershey). *Anat. Rec.* 182(1):103-122, 1975.

The ultrastructure of various developmental stages of the fetal hepatocyte was studied in the stumptail monkey *(Macaca arctoides)*. Groups of six to eight females were mated, and pregnancy and gestational age were determined by bimonthly rectal palpations of the uterus. Fetuses were delivered by Caesarian section between 8:15 and 8:45 A.M. at either 80 (midterm) or 160 (nearterm) days gestation. Immediately following delivery, a slice of the anterior medial portion of the right hepatic lobe was taken from the fetus, fixed in glutaraldehyde, and postfixed in osmium tetroxide. Thin sections were stained in uranyl acetate and lead citrate and studied by electron microscopy. Thick sections of the same blocks (0.5-1.0 μ) were stained with methylene blue and azure C and examined by light microscope. Equivalent specimens were also obtained from a 1-week-old monkey and 12 and 16 week human fetuses. At midterm, 50-70% of a given field was hepatocytes, the rest being hemopoietic tissue. The amounts of hemopoietic tissue and smooth endoplasmic reticulum varied with age, the former decreasing and the latter increasing. The smooth endoplasmic reticular elements were concentrated at the edges of the rough endoplasmic reticular stacks in the immature nearterm. By full nearterm there was a pronounced aggregation of smooth elements in the peripheral cytoplasm. Similar aggregates were seen at 1 week postnatal age. It is concluded that fetal monkey hepatocytes have smooth endoplasmic reticulum, which correlates with their ability to metabolize drugs.

3788 ULTRASTRUCTURAL AND CYTOCHEMICAL STUDY OF MUCOUS GRANULES IN SURFACE AND CRYPT CELLS OF RAT GASTRIC MUCOSA.

(E.) Yeomans, N. D. (Anat. Dep. C, Univ. Copenhagen, Denmark). *Biol. Gastroenterol.* 7(4):285-290, 1974.

The composite mucous granules in gastric mucosa surface and crypt cells were studied for frequency of occurrence at particular sites, reactivity for complex carbohydrates, and susceptibility to proteolytic digestion. Tissues from antral and fundic mucosa from 10 Wistar rats were fixed by perfusion with glutaraldehyde. Some were postfixed with osmium tetroxide. The mucosal surface and upper quarter of the crypts and the bottom of the crypts were examined by electron microscopy and 1000 granules counted in each region. Glycoproteins were demonstrated by a modification of the periodic-chromic acid-silver methenamine method, and protein digestion was carried out by incubation with pronase E. Two types of mucous granule profiles were seen in the surface and crypt cells, depending on the method of fixation. When postfixed with osmium, some granules appeared moderately electron dense and homogenous; the rest appeared to have a highly electron dense core surrounded by a moderately dense outer shell. The cores were central or eccentric with a modal diameter of 250 nm; core to granule diameter ratio was about 1:2. When fixed with glutaraldehyde only, the homogenous granules and outer shells of the composite granules appeared obviously extracted. Granules with cores were more common at the mucosal surface and upper parts of the crypts than at the crypt bottoms both in the antrum and in the fundus. The homogenous granules and outer shells of the composite granules gave a strong cytochemical carbohydrate reaction, but the composite granule cores were non-reactive. Proteolytic digestion removed the cores while leaving the outer shells unchanged. It is concluded that composite granules are common at the surface of rat gastric mucosa and contain cores which are probably of protein with little or no carbohydrate.

3789 ULTRASTRUCTURAL LOCALIZATION OF ACTIN-LIKE FILAMENTS IN RAT HEPATOCYTES. *(E.)* French, S. W.; Davies, P. L. (Dep. Pathol., Univ. British Columbia, Vancouver, Canada). *Gastroenterology* 68(4): 765-774, 1975.

The heavy meromyosin binding technique was used to ultrastructurally identify actin-like microfilaments in hepatocytes. Liver and parotid tissue from three Wistar rats was glycerinated and incubated with heavy meromyosin in three experiments. Pieces of tissue (1-2 mm cubes) were placed in standard salt solution containing 50% glycerol. The glycerol concentration was reduced to 25% and after 4-12 hr was replaced by heavy meromyosin for 24 hr. After fixation in glutaraldehyde, tissues were examined by electron microscope. The parotid tissue served as a positive control. Negative controls were not exposed to heavy meromyosin. The effects of ATP and pyrophosphate on heavy meromyosin binding to actin filaments were tested in two experiments by including these substances with the heavy meromyosin during the filament decoration step. Results were similar for both liver and parotid tissues. In glycerated cells not incubated with heavy meromyosin two filament types were observed: a fine interconnecting network of filaments 5.4-5.9 nm in diameter adjacent to the plasma membrane; and straight filaments, single or in bundles, parallel to the plasma membrane and also deep within the cytoplasm. In the heavy meromyosin-incubated liver, the fine filament network appeared much more abundant than in controls; individual filaments were thicker and covered with spikelike extensions. They connected with the plasma membrane, organelles, and each other, and intersected at close to 90° angles. The straight filaments, in contrast, did not bind heavy meromyosin and appeared to be reduced in number after incubation. They ranged from 8-10 nm in diameter. Pyrophosphate inhibited heavy meromyosin decoration incompletely, while ATP caused complete inhibition. The filament network was largely beneath the plasma membrane facing the sinusoid but was also prominent around the bile canaliculus; the distribution corresponded to the polygonal pattern of actin, as demonstrated by smooth muscle binding antibodies. It is concluded that the ectoplasmic microfilament network is actin and is part of the cell's contractile system.

3790 ONTOGENETIC CHANGES IN THE ULTRASTRUCTURE OF RAT HEPATOCYTE ORGANELLES AFTER PRENATAL X-IRRADIATION. *(E.)* Chedid, A.; Nair, V. (Univ. Cincinnati Sch. Med., Ohio). *Radiat. Res.* 62(1):123-132, 1975.

The radiation-induced suppressive effect on enzyme development in the rat hepatocyte was studied with respect to ultrastructural changes in the endoplasmic reticulum. Pregnant Sprague-Dawley rats received 50 r to the pelvic region on the 13th gestation day and were sacrificed on the 15th and 20th gestation days. In a postnatal series, offspring were sacrificed on the day of birth and the fifth postnatal day. Liver specimens from four fetuses or neonates of each time period were cut into 1 mm^3 cubes and examined by electron microscopy. On the 15th gestation day, fetal hepatocytes, in addition to the normal even cytoplasmic distribution of ribosomes, showed large dense polyribosomal aggregates near the nucleus and cell periphery, sometimes with numerous microtubules and dilatation of the rough endoplasmic reticulum. In the 20th gestation day hepatocytes, smooth endoplasmic reticulum failed to appear. By the day of birth, the polyribosomal aggregates were gone, but smooth endoplasmic reticulum still had not appeared, and necrotic hepatocytes were common in the centrilobular area. In the fifth postnatal day the smooth endoplasmic reticulum had appeared. It is concluded that in conjunction with previous findings, lipid peroxidation, membrane alteration, delayed appearance of smooth endoplasmic reticulum, and polyribosomal aggregation may be sequentially linked events after irradiation.

3791 ELECTRON MICROSCOPE AUTORADIOGRAPHIC STUDY OF INTESTINAL ABSORPTION OF DECANOIC AND OCTANOIC ACIDS IN THE RAT. *(E.)* Carlier, H.; Bezard, J. (Inst. Appl. Biol. Nutr. Aliment., Dijon, France). *J. Cell Biol.* 65(2):383-397, 1975.

Intestinal absorption of [^{3}H]octanoic acid and [^{3}H] decanoic acid was investigated in the rat by electron microscope autoradiography. The common duct of the rats was diverted and a loop of the duodenum was cannulated 24 hr later. Tritiated octanoic acid and decanoic acid were introduced into the lumen of each duodenal loop, and uptake was allowed to proceed for various times up to 15 min. The loop was then removed; one part was used to determine the distribution of radioactivity in different lipid fractions, and an autoradiographic study was performed on the other part of the loop. Radioactivity distribution showed that medium chain fatty acids were absorbed in their nonesterified form and that they were absorbed much more rapidly than oleic acid, a long chain fatty acid. Autoradiographic studies indicated that the medium chain fatty acids were taken up in a molecular or aggregate molecular form, left the epithelial cells by way of the lateral plasma membrane, and were next found in the blood capillaries. The results suggest that the Golgi complex does not play an important role in the absorption of unesterified fatty acids, but seems involved only in the transfer of esterified long chain fatty acids.

3792 HISTOLOGICAL CHANGES IN THE INTESTINAL TRACT OF PREGNANT MICE INFECTED WITH COXSACKIEVIRUS B3. *(E.)* Lansdown, A. B. G. (Clin. Res. Cent., Harrow, England). *Experientia* 31(3):327-328, 1975.

The possibility that protein malnutrition in mice infected with coxsackievirus B3 may be sufficient to elicit morphological changes in the intestinal tract leading to an impaired absorption of essential nutrients which are important for normal fetal growth, as well as for maintaining good maternal health, was examined. Mice were inoculated i.m. with 0.3 ml live or heat-inactivated virus suspension on the eighth day of pregnancy and killed by cervical dislocation on the 18th day. Representative segments of liver, pancreas, stomach, duodenum, ileum, cecum, and colon were fixed in phosphate buffered formalin for histological examination. The stomach and upper regions of the intestinal tract of infected animals appeared normal. The ileum, cecum, and upper colon, however, appeared to be dilated and edema of the lamina propria was identified. In the cecum and colon profound edema was present with a marked dilatation of the gut lumen associated with a thinning and distension of the mucosae. Focally the mucosa was reduced to a single layer of cuboidal cells with few mucus-secreting cells and poorly defined basement membrane. The intestinal changes of edema and focal mucosal atrophy are consistent with a short period of protein deficiency. The implications of these intestinal changes upon the state of health of the pregnant mouse or on the development of the fetuses at 18 days gestation are unclear. In view of previously published evidence that the absorptive capacity of the gut is altered only in advanced cases of protein deficiency resulting from several months deprivation, it is unlikely that the early intestinal changes present in these coxsackievirus-infected mice at the stage examined present any appreciable risk to the health of pregnant mice.

3793 THE ULTRASTRUCTURE OF BRUSH BORDER CELLS IN THE INTESTINE OF NINE TO TEN-WEEK-OLD HUMAN EMBRYOS. *(Rus.)* Kovalchuk, V. K. (Kiev Sci. Res. Inst. Infect. Dis., USSR). *Arkh. Anat. Gistol. Embriol.* 67(10):74-77, 1974.

Electron microscope examination of the intestinal mucosa from 9 to 10 week old human embryos revealed a wide range of intracellular differentiation. Deep inside the mucous gland, brush border cells were poorly differentiated: there were few mitochondria with isolated cristae and poorly developed endoplasm and Golgi's cells. The central regions of the supranuclear zone contained finely granular electron-transparent material which looked like the cytoplasmic matrix of continuously cultured cells. As the differentiation proceeded, this material was replaced by the membranes of the endoplasmic system, ribosomes and mitochondria. In the overlying parts of the crypts, there was dense granular cell structures amidst the cytoplasmic structures. The poor differentiation of brush border cells was combined with enzyme deficiency which was manifested by the negative reaction to acid phosphatase. These findings suggest that the surface layer of the intestinal epithelium may develop during early histogenesis and undergo molecular rearrangement after birth.

3794 FUNCTIONAL POLARITY OF THE RAT HEPATOCYTE SURFACE MEMBRANE: ISOLATION AND CHARACTERIZATION OF PLASMA-MEMBRANE SUBFRACTIONS FROM THE BLOOD-SINUSOIDAL, BILE-CANALICULAR AND CONTIGUOUS SURFACES OF THE HEPATOCYTE. *(E.)* Wisher, M. H.; Evans, W. H. (Natl. Inst. Med. Res., London, England). *Biochem. J.* 146(2):375-388, 1975.

The distribution of a hormone-sensitive adenylate cyclase and a range of enzymic, chemical, and morphological properties were examined in 6 purified plasma-membrane subfractions of liver homogenates from fasted Sprague-Dawley rats. The six subfractions were prepared using a combination of differential, rate-zonal, and density-gradient centrifugation. There were 3 vesicular 'light' subfractions of density 1.12-1.13 and 3 'heavy' subfractions of density 1.16-1.18 containing membrane strips and intercellular junctions. All the subfractions contained a basal adenylate cyclase activity. In one of the light subfractions, the highest glucagon-stimulated adenylate cyclase activity was derived from the blood-sinusoidal face of the hepatocyte; unlike the others, this subfraction was contaminated by Golgi components. All of the subfractions also showed high activities of the following plasma-membrane marker enzymes: 5'-nucleotidase, alkaline phosphodiesterase (nucleotide pyrophosphatase), alkaline phosphatase, leucine naphthyl-amidase, and Mg^{2+}-activated ATP. One light subfraction which showed the highest specific activities of these marker enzymes but lacked a glucagon-stimulated adenylate cyclase activity derived from the bile-canalicular face of the hepatocyte. The heavy subfractions generally showed the lowest enzyme activities, were characterized by the presence of desmosomes and gap junctions, and appeared to originate from the continguous faces of the hepatocyte. Polyacrylamide-gel electrophoresis indicated a general similarity in the protein compositions of the 6 subfractions. Differences in the amounts of various protein and glycoprotein bands correlated with differences in morphology, enzymic composition, and sialic acid content. These results, in conjunction with previous plasma-membrane hormone-binding and histochemical data, indicate the existence of functionally discrete plasma-membrane subfractions originating from geographically separated regions of the hepatocyte surface.

3795 SEBACEOUS GLANDS IN THE WALL OF THE ANAL CANAL OF RATS, MICE AND CLOSELY RELATED RODENTS. *(E.)* Shehata, R. (Fac. Med., Cairo Univ., Egypt). *Acta Anat. (Basel)* 90(2):243-249, 1974.

3796 AN ELECTRON MICROSCOPIC STUDY OF THE PANCREAS AND PAROTID GLAND OF RATS WITH EXPERIMENTAL ACUTE PANCREATITIS. *(E.)* Ishidate, T.; Senoo, A.; Kakizaki, G.; Saito, T.; Fujiwara, Y.; Nihei, T. (Akita Univ. Sch. Med., Japan). *Tohoku J. Exp. Med.* 113(3):213-223, 1974.

3797 THE ULTRASTRUCTURAL LOCATION OF ARYLSULFATASE IN LYSOSOMES. *(Rus.)* Pokrovskii, A. A.; Krystev, L. P.; Tutelian, V. A.; Kravchenko, L. V. (Inst. Nutr., Moscow, USSR). *Dokl. Akad. Nauk SSSR* 222(3):713-715, 1975.

3798 TECHNIQUE FOR STUDYING THE DISTRIBUTION OF GASTRIN CELLS IN THE NORMAL AND DISEASED HUMAN STOMACH. *(Fr.)* Potet, F.; Constantin-Voillemot, N.; Lewin, M. (Beaujon Hosp., Paris, France). *Biol. Gastroenterol. (Paris)* 7(4):296, 1974.

3799 GASTRIN CELLS IN THE STOMACH. *(Fr.)* Potet, F.; Constantin-Voillemot, N. (Beaujon Hosp., Clichy, France). *Ann. Anat. Pathol. (Paris)* 19(4):400-412, 1974.

3800 MORPHOLOGY OF REABSORBING GASTROINTESTINAL EPITHELIA. *(Ger.)* Kulenkampff, H. (Dep. Anat., Univ. Saarland, Homburg/Saar, Germany). *Arzneim. Forsch.* 25(3):461-463, 1975.

3801 AUTORADIOGRAPHIC ANALYSIS OF CELL POPULATION KINETICS IN THE SMALL INTESTINE AND COLON EPITHELIUM DURING EARLY POSTNATAL DEVELOPMENT. *(Rus.)* Zufarov, K. A.; Lomonosova, G. A.; Irgashev, S. B.; Yuldashev, A. Y. (Med. Inst., Tashkent, USSR). *Cytologia (Mosk.)* 16(9):1106-1110, 1974.

3802 AUTORADIOGRAPHIC STUDY OF CELL POPULATION KINETICS IN THE INTESTINAL AND LIVER EPITHELIUM OF Rana temporaria. *(Rus.)* Lanskaya, A. B. (Dep. Cytol. Histol., Leningrad Univ., USSR). *Cytologia (Mosk.)* 16(3):329-334, 1974.

3803 HISTOCHEMISTRY, IMMUNOFLUORESCENCE, AND MODERN PROCEDURES FOR STUDYING RECTAL BIOPSIES. *(Fr.)* Laumonier, R.; Hultric, E.; Delpech, A. (Henri Becquerel Cent., Rouen, France). *Ann. Gastroenterol. Hepatol. (Paris)* 10(4):315-320, 1974.

3804 THE EFFECTS OF COSMIC PARTICLE RADIATION ON PACKET MICE ABOARD APOLLO XVII: APPENDIX III: EVALUATION OF VISCERA AND OTHER TISSUES. *(E.)* Ellis, J. T.; Kraft, L. M.; Lushbaugh, C. C.; Humason, G. L. Hartroft, W. S.; Porta, E. A.; Bailey, O. T.; Greep, R. O.; Leach, C. S.; Laird, T.; Simmonds, R. C.; Vogel, F. S.; Dennis, R. L.; Brashear, H. R.; Talmage, R. V.; Harrison, G. A.; Corbett, R. L.; Klein, G.; Tilbury, T.; Suri, K.; Haymaker, W. (New York Hosp.-Cornell Univ. Med. Cent., N.Y.). *Aviation Space Environ. Med.* 46(4):639-654, 1975.

3805 VASCULAR ALTERATIONS IN CANINE HISTIOCYTIC ULCERATIVE COLITIS. *(E.)* Lawson, T. L.; Gomez, J. A.; Margulis, A. R. (Univ. California Sch. Med., San Francisco). *Invest. Radiol.* 10(3):212-224, 1975.

See also, 3960, 4030, 4053, 4064, 4101, 4175, 4157, 4432, 4489, 4620, 5102.

ABSORPTION-EXCRETION-TRANSPORT

3806 FERRITIN IRON ABSORPTION IN MAN. *(E.)* Layrisse, M.; Martinez-Torres, C.; Renzy, M.; Leets, I. (Dep. Exp. Med., Venezuelan Inst. Sci. Invest., Caracas). *Blood* 45(5):689-698, 1975.

The effect of vegetable and animal foods on the iron absorption from ferritin was studied in 108 Venezuelan peasants. Following an overnight fast, the subjects ingested ferritin alone or mixed with various foods which had been biosynthetically tagged with radioiron. Blood was drawn 15 days later to determine hematologic characteristics and radioactivity. The geometric mean absorption of ferritin iron in both normal and iron-deficient subjects was 1.9%, the mean absorption ranging from 0.9% in the normal subjects to 2.5% in those with moderate iron deficiency to 5.7% in those with marked iron deficiency. The administration of ferritin with vegetable foods (maize, wheat, soybeans) resulted in lower absorption values than those obtained with the same foods alone. The iron absorption from ferritin was markedly increased when it was administered with meat or liver, but it did not reach the level observed with these foods alone. The mean iron absorption from 1 mg of ferritin iron was 2.3%, while that from 1 mg of ferric chloride was 11.7%. Carrier liver increased the absorption of both substances and carrier maize markedly reduced the absorption of ferric chloride. When ferritin was administered with 100 mg of ascorbic acid, the geometric mean absorption of iron was significantly increased over that seen with ferritin alone. The results indicate that purified ferritin has a very low absorbability and that its absorption is affected by substances which enhance or reduce iron absorption in the same proportion as vegetal iron.

3807 DIFFERENT PATHWAYS FOR HEPATIC UPTAKE OF TAUROCHOLATE AND INDOCYANINE GREEN.

(E.) Paumgartner, G.; Reichen, J. (Dep. Clin. Pharmacol., Univ. Berne, Switzerland). *Experientia* 31(3):265-392, 1975.

To determine whether different pathways exist for the hepatic uptake of bile acids and anionic dyes, the kinetics of the hepatic uptake of taurocholate and indocyanine green were compared in the perfused rat liver. The livers of specific-pathogen-free male Sprague-Dawley rats were perfused *in situ*, during which ^{14}C-labeled taurocholate (75-25,000 nM) and/or indocyanine green (ICG, 60-50,000 nM) was rapidly injected into the portal vein along with ^{99}Tc^{m}-albumin. The total venous outflow was collected and the radioactivity counted. Taurocholate and albumin were distributed in equal spaces and a certain fraction of the taurocholate was removed by the liver. Similar dilution curves were obtained with ICG, which was also distributed in equal spaces with albumin. The initial uptake rate of both taurocholate and ICG increased with the extra-vascular dose in a nonlinear fashion, exhibiting saturation kinetics. Analysis of these data revealed compatibility with Michaelis-Menten kinetics for both anions. The maximal uptake capacity of taurocholate exceeded that of ICG by a factor of 9. The apparent half-saturation constants for the hepatic uptake of taurocholate and ICG were 90.6 and 50.0 nM/g liver, resp. There was no significant competition between taurocholate and ICG for uptake by the hepatocytes. The results suggest that different pathways exist for the transport of bile acids and anionic dyes from the blood into the hepatocyte.

3808 FURTHER STUDIES ON THE ACTION OF PROLACTIN ON FLUID AND ION ABSORPTION BY THE RAT JEJUNUM.

(E.) Mainoya, J. R. (Dep. Zool., Univ. California, Berkeley). *Endocrinology* 96(5):1158-1164, 1975.

The effects of *in vivo* prolactin administration on the *in vitro* absorption of fluid and ions by the rat jejunum were studied. Ovine prolactin was administered s.c. to intact and hypophysectomized male Sprague-Dawley rats. Twenty-four or 48 hr later, the nonfasted animals were anesthetized and everted sacs were prepared from segments I-V of the small intestine. The sacs were filled with Ringer solution containing glucose and placed in metabolic incubators, after which mucosal transport was measured. Prolactin administration significantly stimulated fluid, sodium, potassium, calcium, magnesium, and chloride transport across the everted jejunal sacs, the latter 2 ions being the least affected. Hypophysectomy caused a significant decrease in fluid and sodium absorption which was prevented by prolactin treatment. The effects of prolactin on fluid and sodium absorption were dose-dependent, maximal stimulation resulting from the administration of 1.0-2.0 mg; higher doses failed to elicit a significant response. The stimulatory action of prolactin was inhibited by the simultaneous administration of vasopressin, which when given alone had no effect on intestinal absorption. In the absence of glucose or in the presence of phlorizin, fluid transport was inhibited, the reduction most dramatic in the presence of phlorizin. Fluid transport was also reduced by the application of ouabain or partial replacement of sodium with isotonic choline chloride. These results suggest that the effects of prolactin on intestinal transport may be dependent on the increased movement of sodium.

3809 KINETICS OF Na^{+} UPTAKE AND TRANSCELLULAR TRANSIT BY THE PANCREAS.

(E.) Rossier, M.; Rothman, S. S. (Dep. Physiol., Univ. California, San Francisco). *Am. J. Physiol.* 228(4):1199-1205, 1975.

The kinetics of Na^{+} uptake and transcellular transit by pancreatic tissue was studied to determine the model for tissue uptake of the molecule. ^{22}Na uptake into strips of rabbit pancreas was measured for up to 10 min. The uptake curve was characterized by the presence of 2 plateaus separated by an inflexion point; a 1st plateau was observed between 1 and 3 min; between 3 and 4 min the slope of the uptake curve increased again; it finally decreased to a new and higher steady-state uptake between 4 and 6 min. The data suggest that the 1st part of the uptake curve (0-3 min) represents uptake into the cells, and the 2nd part (3-10 min) represents the sum of "quasi" steady-state cellular uptake and of the equilibration of the ductal compartment in series with the cells. A delay of 2.5-3.25 min elapsed between the filling of cellular and ductal compartments, which appeared to be of intracellular origin (restricted Na^{+} diffusion within the cytoplasm and an intracellular Na^{+} gradient). Based on that model, the transit time for Na^{+} across the whole organ was expected to be 3-4 min and was found to be 3.5 min when studied *in vitro*. The transepithelial transit of Na^{+} appeared to account for most of that time. The data indicate that a substantial delay exists between the filling of the cells and the ducts; thus, tissue uptake may be described as the sum of an exponential and a sigmoid function.

3810 EFFECT OF A COMBINED THIAMINE AND RIBOFLAVIN DEFICIENCY ON INTESTINAL ABSORPTION OF ESSENTIAL AMINO ACIDS.

(Fr.) Wellers, G.; Chevan, J. (Unit. Inform. Biomed. Res., Paris, France). *Ann. Nutr. Alim.* 28(1):49-63, 1974.

Male Wistar rats were fed a diet containing all 10 essential amino acids plus other essential nutrients but deficient in thiamine and riboflavin. After 20 days, the rats were deprived of all amino acids, but glycine and L-glutamic acid were added to the diet. Three days later, the rats were fasted for 24 hr and a mixture containing all previous nutrients was instilled into their stomachs. After 6 hr, the animals were sacrificed and the amino acid levels in the intestinal contents, blood and gastrointestinal tissues were determined by microbiological assays. Thiamine-deficient rats absorbed arginine at a normal rate, but the other nine essential amino acids were absorbed more slowly than normal. A riboflavin deficiency increased the absorption rate for all amino acids but tryptophan. When rats were deficient in both thiamine and riboflavin, the absorption of histamine, leucine, lysine, methionine, phenylalanine, threonine, and valine were decreased, while arginine, isoleucine, and tryptophan were absorbed at normal rates. Disorders in amino acid absorption in vitamin-deficient rats may be the primary cause of signs of disorders in protein metabolism (weight loss, anorexia) that were observed.

3811 LIVER UPTAKE OF AMINO ACIDS AND CARBOHYDRATES DURING A SINGLE CIRCULATORY PASSAGE. *(E.)* Pardridge, W. M.; Jefferson, L. S. (Milton S. Hershey Med. Cent., Hershey, Pa.). *Am. J. Physiol.* 228(4):1155-1161, 1975.

The uptake of ^{14}C-labeled amino acids and carbohydrates by rat liver following rapid injection into the portal vein was measured using tritiated water as an internal standard; the applicability of this technique (Oldendorf technique) to the study of liver transport systems was then judged. A 0.25 ml bolus of buffered Ringers solution containing 1-2 μCi of the ^{14}C-labeled test substance 3-6 μCi of tritium-labeled water (^{3}HOH) was administered by rapid portal injection into anesthetized male Sprague-Dawley rats. Circulation was terminated after a single passage of the bolus through the hepatic microvasculature and the tissue was immediately macerated, solubilized, and subjected to liquid scintillation counting. Liver uptake indices (LUI) were calculated from the ratio of ^{14}C to ^{3}H in the liver tissue relative to this ratio in the injection mixture. The LUI's of sucrose, inulin, D-mannitol, D-glucose, and L-glucose were 24.3%, 27.7%, 80.2%, 96.8%, and 26.7%, resp.; the LUI for cholic acid was 127.1%. Among the 18 amino acids tested, the LUI's were highest for the acidic compounds (e.g., L-aspartic acid, 100%, and L-glutamic acid, 86.4%) and lowest for the more basic compounds (e.g., L-arginine, 37.4%, and L-lysine, 31.4%). Stereospecificity for glucose and alanine uptake, saturation kinetics for glutamic acid (K_m = 4.8 mM) and aspartic acid (K_m = 2.7 mM), and cross-inhibition among uptake of the various amino acids were observed. The data confirm the applicability of the Oldendorf technique, which was originally developed for studies of amino acid uptake into the brain, for the characterization of transport systems in the liver.

3812 EFFECTS OF CHRONIC ETHANOL ADMINISTRATION ON INTESTINAL ABSORPTION IN MAN IN THE ABSENCE OF NUTRITIONAL DEFICIENCY. *(E.)* Lindenbaum, J.; Lieber, C. S. (Harlem Hosp. Cent., New York, N.Y.). *Ann. N.Y. Acad. Sci.* 252:228-234, 1975.

The effects of chronic alcohol administration on intestinal absorption in man was studied under controlled metabolic ward conditions to determine whether ethanol alone, in the absence of associated nutritional deficiency, causes impairment of small bowel function. Asymptomatic middle-aged male volunteers with histories of chronic alcoholism were given 173-253 g/day of ethanol (46-66% of the total caloric intake) along with vitamin supplementation. Vitamin B_{12} absorption was studied by the urinary excretion method of Schilling following the oral administration of ^{57}Co-cyanocobalamin (0.75 μg) with intrinsic factor concentrate. The excretion of urinary xylose and fecal fat were also determined following the oral or i.v. administration of D-xylose. In 6 subjects, the excretion of B_{12} was reduced during ethanol administration compared with periods of abstinence (control); no depression in vitamin B_{12} absorption was seen in the other 2 subjects, both of whom received the smallest amount of ethanol. The concomitant administration of pancreatic extract did not improve B_{12} absorption during ethanol administration. Urinary xylose and serum xylose increased during ethanol administration and fecal fat excretion was reduced. The absorption of xylose and fat was not inhibited by alcohol administration. The results indicate that chronic ethanol administration results in impaired B_{12} absorption in man despite adequate nutrient intake.

3813 PASSAGE OF PARTICLES THROUGH THE WALL OF THE GASTROINTESTINAL TRACT. *(E.)* Volkheimer, G. (no affil.). *Environ. Health Perspect.* 9:215-225, 1974.

The persorption of macrocorpuscular particles through the wall of the gastrointestinal tract is discussed in terms of mechanisms, rate, and the elimination, phagocytosis, enzymatic degradation, and deposition of persorbed particles. Persorption of particles in the micrometer size range is possible wherever the intestinal mucosa is covered by a single layer of epithelium. Primary transportation of persorbed particles from the digestive tract may take place in the chyle and *via* the portal circulation. The persorbed particles are found between the cells of the epithelial layer, in the subepithelial region of the mucosa, and within the lumen of lymph and blood vessels. The rate of persorption depends on factors such as the age of the subject, quantity of particles supplied, and the muscular activity of the intestine; the rate increases during deep physiological sleep and under the influence of cigarette smoking, caffeine, and prostigmine, and decreases during barbiturate sleep. Persorbed particles may be eliminated in the urine, bile, and milk (in lactating women), and have been observed to pass into the peritoneal cavity and cerebrospinal fluid; extravasation from the vessels in the pulmonary alveoli and transplacental passage have also been confirmed. Phagocytosis by micro- and macrophages was observed in the peritoneal cavity and spleen, and enzymatic degradation of starch granules in the body fluids was demonstrated. Finally, after long-term oral administration, deposition of embolized starch granules and other persorbed particles in the lumen of the smallest vessels has been noted.

3814 MEASUREMENT OF SUGAR ABSORPTION DURING DIGESTION OF CORNSTARCH IN SWINE. *(Fr.)* Rerat, A.; Aumaitre, A.; Vaissade, P.; Vaugelade, P. (Lab. Nutritional Physiol., INRA, Jouy-en-Josas, France). *C. R. Acad. Sci.* [*D*] *(Paris)* 279(10):831-834, 1974.

Glucose absorption during cornstarch digestion was measured quantitatively in 4 swine fitted with permanent cannulas in the portal vein and the anterior vena cava. Blood volumes were continuously recorded with electromagnetic flow meters. Experimental diets containing 150g protein, vitamins, minerals, and 400-1200g cornstarch were fed after 16 or 22 hr fasts, and blood glucose levels were monitored from 30 min before to 8 hr after meals. In spite of large variations in blood flow, the quantities of glucose absorbed were very consistent. Absolute quantities of glucose absorbed were directly proportional to the amount of cornstarch fed, but were relatively higher when smaller portions were ingested. The digestion time was very long and may be as long as 22-29 hr when large quantities of cornstarch are fed. This is in marked contrast to the absorption of amino acids after digestion of proteins, which is almost complete after 8 hr.

3815 THE INFLUENCE OF GLUCAGON ON JEJUNAL ABSORPTION OF GLUCOSE, WATER AND ELECTROLYTES IN MAN. *(Ger.)* Gottesburen, H.; Leising, H.; Menge, H.; Lorenz-Meyer, H.; Riecken, E. O. (Med. Clin., Univ. Marburg/Lahn, Germany). *Klin. Wochenschr.* 52(19):926-929, 1974.

The influence of glucagon on the resorption of glucose, water, sodium and potassium was studied by means of the segmental small-intestinal perfusion method with a three-channelled needle in the upper jejunum in three groups of subjects. These included healthy adults; eight maturity-onset diabetics with reduced insulin secretion after glucagon dose; and six patients with juvenile diabetes mellitus who required insulin. After measuring resorption over two 30-min periods the test subjects received 1 mg i.v. of glucagon and the resorption was determined during four 15 min periods. After glucagon administration in all three groups there was an increase of short duration in glucose absorption. This was more pronounced in the diabetics than in the healthy subjects. Subsequently a significant decrease of glucose absorption took place. Sodium and water uptake were reduced by glucagon administration; in all three groups there was a transient secretion of potassium into the intestinal lumen. These results, obtained after application of pharmacological doses, do not show clearly whether the demonstrated changes of resorption result directly from glucagon or from regulatory processes.

3816 EFFECTS OF BOVINE GROWTH HORMONE, HUMAN PLACENTAL LACTOGEN AND OVINE PROLACTIN ON INTESTINAL FLUID AND ION TRANSPORT IN THE RAT. *(E.)* Mainoya, J. R. (Dep. Zool., Univ. California, Berkeley). *Endocrinology* 96(5):1165-1170, 1975.

The influence of bovine growth hormone and human placental lactogen on intestinal absorption was compared with that of ovine prolactin. Normal and hypophysectomized adult male Sprague-Dawley rats were anesthesized and everted intestinal sacs were prepared from segments III and IV of the jejunum and from the entire colon. The sacs were filled with Ringer solution containing glucose and were placed in metabolic incubators; after incubation, mucosal transport was measured. One mg of bovine growth hormone, ovine prolactin, and/or purified human placental lactogen was injected s.c. 24 or 48 hr before surgery. Administration of each of these hormones resulted in increased fluid and electrolyte transport by the intestinal mucosa. Hypophysectomy produced a fall in fluid and ion absorption in the jejunum, but these changes were prevented by growth hormone administration. Bovine growth hormone and ovine prolactin produced essentially similar effects in intact rats: significant increases in fluid, sodium, and calcium transport in the duodenum; significant increases in fluid, sodium, and potassium transport in the jejunum; and significant increases in sodium, chloride, potassium, and calcium transport in the ileum. Growth hormone also significantly increased the transport of fluid, sodium, and chloride in the colon. Treatment of hypophysectomized rats with human placental lactogen enhanced fluid and ion transport in the jejunum but failed to restore normal potassium transport in the ileum and colon. The results suggest that growth hormone and human placental lactogen affect jejunal water and electrolyte transport in the same manner as does prolactin, possibly by influencing active ion transport.

3817 EFFECTS OF GASTROINTESTINAL HORMONES ON ADENYLATE CYCLASE ACTIVITY IN HUMAN JEJUNAL MUCOSA. *(E.)* Klaeveman, H. L.; Conlon, T. P.; Levy, A. G.; Gardner, J. D. (Natl. Inst. Arthritis, Metab. Dig. Dis., Bethesda, Md.). *Gastroenterology* 68(4):667-675, 1975.

The effects of various polypeptide hormones on the adenylate cyclase activity in the human small intestinal mucosa were investigated to determine the mechanism by which such hormones alter the intestinal transport of salt and water. Peroral small intestinal biopsy specimens were obtained from 19 normal subjects of both sexes. Adenylate cyclase activity in the homogenized samples were determined by measuring the formation of ^{32}P-labeled cyclic AMP from (α^{32}P)ATP in the presence of reaction mixtures containing the various hormones. Vasoactive intestinal polypeptide (VIP) and prostaglandin E_1 (PGE$_1$) activated adenylate cyclase at concentrations of 10^{-7} M, maximal stimulation occurring at concentrations of 10^{-4} M; the effects of these agents were additive. Neither glucagon nor secretin stimulated adenylate cyclase or altered the stimulation produced by VIP or PGE$_1$. Gastrin, cholecystokinin-octapeptide, pentagastrin, human calcitonin, and salmon calcitonin were also incapable of activating adenylate cyclase or altering the stimulating activity of PGE$_1$ or VIP. Several guanyl nucleotides, including guanosine monophosphate, guanosine diphosphate, guanosine triphosphate, and 5'-guanylyl imidodiphosphate, significantly increased basal adenylate cyclase activity but did not alter the effects of PGE_1 or VIP. Several other nucleotide triphosphates (xanthosine triphosphate, inosine triphosphate, cytidine triposphate, uridine triphosphate) did not alter adenylate cyclase activity. These data suggest that VIP and PGE_1 act at functionally distinct sites and that the other polypeptide hormones tested do not interact with the receptors with which VIP and PGE_1 combine to increase adenylate cyclase activity.

3818 STUDIES ON THE METABOLISM OF DIMETHYLNITROSAMINE IN THE RAT. I. EFFECT OF DOSE, ROUTE OF ADMINISTRATION AND SEX. *(E.)* Phillips, J. C.; Lake, B. G.; Heading, C. E.; Gangolli, S. D.; Lloyd, A. G. (Br. Ind. Biol. Res. Assoc., Carshalton, Surrey, England). *Food Cosmet. Toxicol.* 13(2): 203-209, 1975.

Some of the factors affecting the metabolism of dimethylnitrosamine (DMN) in the rat were investigated. ^{14}C-DMN (0.2 ml/100 g) was administered i.p., s.c., i.v. and *via* oral intubation to mature and immature male and female specific-pathogen-free Wistar rats. The excretion of $^{14}CO_2$ was monitored. In other experiments, ^{14}C-DMN was injected s.c. or into the stomachs of pylorus-ligated rats and the absorption of ^{14}C-DMN from the stomach and small intestine was studied. Exhalation of unchanged ^{14}C-DMN accounted for less than 0.4% of the injected dose in the first experiment; the maximum rate of $^{14}CO_2$ production occurred between hr 1 and 4, less than 3% of the injected dose being exhaled between 6 and 24 hr. The maximum rate of $^{14}CO_2$ production was related to dose in both males and females, and the maximum rate of production was significantly lower in mature than immature animals. $^{14}CO_2$ production and the amount of ^{14}C excreted in the urine were similar for all p.o. administration but was significantly lower after p.o. administration. In the pylorus-ligated animals, the maximum rate of $^{14}CO_2$ production and the percentage $^{14}CO_2$ produced in 7 hr were only 45% of the control values. The disappearance of ^{14}C-DMN from the stomach was considerably smaller than from the small intestine, and absorption from the stomach, but not the small intestine, was significantly more rapid in starved than in fed rats. The percentage of ^{14}C remaining in the stomach did not appear to depend on the initial concentration of DMN. The kinetics of the disappearance of radioactivity from the small intestine varied with the intraluminal concentration of ^{14}C-DMN, following a monoexponential curve at very low concentrations and a biexponential curve at higher concentrations. The results suggest that the lower rate of DMN metabolism after oral administration is probably due to slower absorption of this compound from the stomach.

3819 ACTIVE AMINO-ACID AND SUGAR UPTAKE BY GALL BLADDER EPITHELIUM IN DOG, GUINEA-PIG AND MAN. *(E.)* Mirkovitch, V.; Sepulveda, F. V.; Menge, H.; Robinson, J. W. L. (Canton. Hosp., Lausanne, Switzerland). *Pflugers Arch.* 355(4):319-330, 1975.

The *in vitro* uptake of various sugars and amino acids by slices of canine gallbladder mucosa was studied. Samples of gallbladder and common bile duct from adult mongrel dogs, rabbits, guinea-pigs, and human beings were incubated in media containing ^{14}C-labeled substrates, and tissue uptake of radioactivity was determined by liquid scintillation counting. To determine the effect of bile retention on the transport capacity of the canine gallbladder mucosa, the common bile duct was ligated just proximal to the papilla vateri, and the gallbladder and bile duct were excised for examination 2 weeks later. The canine gallbladder was able to accumulate amino acids and sugars against considerable concentration gradients across the luminal membrane of the cell; the epithelium of the common bile duct also absorbed these compounds. The transport systems were sodium-dependent, saturable, and inhibited by ouabain and metabolic poisons (2,4-dinitrophenol and iodoacetic acid). Glycine was preferentially transported across the canine gallbladder from the mucosa to the serosa, but the net flux was small. Concentrative uptake also occurred in the guinea-pig and human gallbladders but appeared to be practically nonexistent in rabbit tissue. The gallbladder epithelium proved to be remarkably resistant to anoxia, and was able to concentrate amino acids and sugars, although to a significantly reduced extent, 2 weeks after obstruction of the common bile duct. The results indicate that the centraluminal membrane of the epithelial cell might be relatively impermeable to glycine and suggest a close similarity between the transport mechanism situated in the luminal membrane of the gallbladder and the proximal tubular cell of the kidney.

3820 MORPHOLOGICAL AND FUNCTIONAL BASIS OF DIGESTION AND ABSORPTION IN THE DIGESTIVE TRACT. *(Pol.)* Ziemlanski, S. (Inst. Physiol. Biochem., Warsaw, Poland). *Przegl. Lek.* 31(2):316-322, 1974.

3821 CONTROLLED AND UNCONTROLLED INFLUENCES ON DRUG AVAILABILITY. *(Ger.)* Speiser, P. (Inst. Pharm., Fed. Univ. Zurich, Switzerland). *Arzneim. Forsch.* 25(3):470-476, 1975.

3822 ABSORPTION AND SECRETION OF DRUGS BY THE MUCOSAL EPITHELIA OF THE GASTROINTESTINAL TRACT. *(Ger.)* Lauterbach, F. (Inst. Pharmacol. Toxicol., Ruhr Univ., Bochum, Germany). *Arzneim. Forsch.* 25(3):479-488, 1975.

3823 ABSORPTION, DISTRIBUTION AND EXCRETION OF $[^{14}C]$CTAB, A QUARTERNARY AMMONIUM SURFACTANT, IN THE RAT. *(E.)* Isomaa, B. (Inst. Biol., Abo Acad. Turku, Finland). *Food Cosmet. Toxicol.* 13(2): 231-237, 1975.

3824 ABSORPTION OF SELECTED FATTY ACIDS OF RAPESEED OIL IN THE ALIMENTARY TRACT. *(Pol.)* Ziemlanski, S.; Cieslakowa, D.; Okolska, G.; Kucharczyk, B. (Inst. Physiol. Biochem., Warzaw, Poland). *Przegl. Lek.* 31(2):322-327, 1974.

3825 pH AND BICARBONATE EXCRETION IN THE RAT PAROTID GLAND AS A FUNCTION OF SALIVARY RATE. *(E.)* Sommer, H. M.; Kaiser, D.; Drack, E. (Pediatr. Clin., Univ. Bern, Switzerland). *Pfluegers Arch.* 355 (4):353-360, 1975.

3826 ORGANIZATION OF THE BRUSH BORDER AND THE CONCEPT OF DIGESTION-ABSORPTION: RECENT FINDINGS ON ENTEROCYTE ULTRASTRUCTURE. *(Fr.)* Schmitz, J.; Jos, J.; Drillet, F.; Rey, F.; Rey, J. (Hosp. Sick Child., Paris, France). *Arch. Fr. Pediatr.* 31 (2/3):231-240, 1974.

3827 PARTICIPATION OF SUBCORTICAL NERVOUS STRUCTURES IN THE REGULATION OF INTESTINAL ABSORPTION. *(Rus.)* Faitelberg, R. O.; Vengrzhanovskii, P. N. (Dep. Hum. Anim. Physiol. I. I. Mechnikov State Univ. Odessa, USSR). *Fiziol. Zh. SSSR* 61(4):636-641, 1975.

3828 INTESTINAL IRON ABSORPTION IN ONE TO FOUR MONTH OLD INFANTS FED IRON-ENRICHED FORMULAS. *(Ger.)* Mahdi, S.; Heine, W. (Pediatr. Clin., Univ. Rostock, Germany). *Kinderaerztl. Prax.* 42(11): 505-508, 1974.

3829 INTESTINAL ABSORPTION OF CARBOHYDRATES AND TRIGLYCERIDES. *(Ger.)* Clodi, P. H. (Monk-Hospitaller Public Hosp., Linz, Austria). *Arzneim. Forsch.* 25(3):476-479, 1975.

3830 INFLUENCE OF HORMONES ON INTESTINAL TRANSFER OF WATER AND ELECTROLYTES. *(Ger.)* Ewe, K. (Med. Clin. I, Univ. Mainz, Germany). *Arzneim. Forsch.* 25(3):499-506, 1975.

3831 DUODENAL HORMONES AND THE POTENTIAL DIFFERENCE IN THE INTESTINE. *(Fr.)* Wingate, D. L.; Cooper, W. (London Hosp. Med. Coll., England). *Biol. Gastroenterol. (Paris)* 7(4):394, 1974.

3832 PENETRATION OF PROTEINS THROUGH INTESTINAL WALL OF PIGLETS BORN AT DIFFERENT TIMES DURING GESTATION. *(Ukr.)* Hrytsenko, N. M.; Kovalenko, V. F. (Poltava Res. Inst. Swine Breeding, USSR). *Ukr. Biokhim. Zh.* 46(1):79-83, 1974.

3833 THE INFLUENCE OF DRUGS ON THE ABSORPTIVE CAPACITY OF INTESTINAL MUCOSA. *(Ger.)* Caspary, W. F. (Univ. Med., Clin., Gottingen, Germany). *Arzneim. Forsch.* 25(3):489-498, 1975.

3834 AN ANOMALOUS EFFECT OF THE INTERMEDIATE PRODUCTS OF RIBOFLAVINE PHOTOLYSIS ON THE INTESTINAL ABSORPTION OF POORLY ABSORBED WATER-SOLUBLE DRUGS IN RATS. *(E.)* Ghazy, F. S.; Kimura, T.; Muranishi, S.; Sezaki, H. (Fac. Pharm. Sci., Kyoto Univ., Japan). *J. Pharm. Pharmacol.* 27(4):268-272, 1975.

3835 INTESTINAL FUNCTION IN CHRONIC ALCOHOLISM. *(E.)* Mezey, E. (Baltimore City Hosp., Md.). *Ann. NY Acad. Sci.* 252:215-227, 1975.

3836 INHIBITION BY CAFFEINE OF ETHANOL ABSORPTION IN RATS. *(It.)* Siegers, C. P.; Strubelt, O.; Back, G. (Med. Acad., Lubecka, Germany). *Arch. Sci. Med. (Torino)* 131(3):173-180, 1974.

3837 BILE ACIDS AND ACTIVE TRANSPORT OF SUGARS AND AMINO ACIDS. *(Ger.)* Caspary, W. F. (Med. Clin., Univ. Gottingen, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:412-415, 1974.

3838 RADIOISOTOPE METHOD IN THE STUDY OF THE ABSORBING CAPACITY OF SEPARATE SEGMENTS OF THE SMALL INTESTINE. *(Rus.)* Kosharko, K. A.; Volkov, D. M.; Nalivkina, A. I.; Telnov, Y. A. (Inst. Roentgenol. Med. Radiol., Borisov, USSR). *Med. Radiol. (Mosk.)* 19(8):17-20, 1974.

3839 EFFECTS OF HUMAN SYNTHETIC GASTRIN I ON WATER, ELECTROLYTE, AND GLUCOSE ABSORPTION IN THE HUMAN SMALL INTESTINE. *(Fr.)* Modigliani, R.; Mary, J. Y.; de Peyer, R.; Bernier, J. J. (St. Lazare Hosp., Paris, France). *Biol. Gastroenterol. (Paris)* 7(4):309-310, 1974.

3840 ABSORPTION AND SECRETION BY THE COLON. *(E.)* Cummings, J. H. (Cent. Middlesex Hosp., London, England). *Gut* 16(4):323-329, 1975.

3841 THE EFFECT OF A DEPHENOLIC LAXATIVE (BISACODYL) ON WATER AND ELECTROLYTE TRANSPORT IN THE HUMAN COLON. *(Ger.)* Ewe, K.; Holker, B. (1st Med. Polyclin., Univ. Mainz, Germany). *Klin. Wochenschr.* 52(17):827-833, 1974.

3842 ION TRANSPORT BY AMPHIBIAN ANTRUM IN VITRO. I. GENERAL CHARACTERISTICS. *(E.)* Flemstrom, G.; Sachs, G. (Lab. Memb. Biol., Univ. Alabama, Birmingham). *Am. J. Physiol.* 228(4):1188-1198, 1975.

3843 QUANTITATION OF CONDUCTANCE: PATHWAYS IN ANTRAL GASTRIC MUCOSA. *(E.)* Spenney, J. G.; Flemstrom, G.; Shoemaker, R. L.; Sachs, G. (VA Hosp., Birmingham, Alabama). *J. Gen. Physiol.* 65 (5):645-662, 1975.

3844 THE EFFECTS OF ACUTE ALTERATIONS IN HEMODYNAMICS, OXYGEN AVAILABILITY AND ACID BASE BALANCE ON THE PERMEABILITY OF THE GASTRIC MUCOSA. *(E.)* Ritchie, Jr., W. P. (Dep. Surg., Univ. Charlottesville, Va.). 7 pp., 1975. [available through National Technical Information Services, Washington, D.C. Document No. AD-A008 093/7WJ]

3845 CALCIUM ABSORPTION AS A FUNCTION OF CALCIUM INTAKE. *(E.)* Heaney, R. P.; Saville, P. D.; Recker, R. R. (Creighton Univ. Sch. Med., Omaha, Neb.). *J. Lab. Clin. Med.* 85(6):881-890, 1975.

3846 TIN — RESORPTION, PERORAL TOXICITY AND MAXIMUM ADMISSABLE CONCENTRATION IN FOODS. *(E.)* Knorr, D. (Inst. Food Technol., Sch. Soil Cult., Vienna, Austria). *Lebensm. Wiss. Technol.* 8(2):51-56, 1975.

3847 BACKGROUND CONSIDERATIONS OF INTESTINAL CALCIUM ABSORPTION AND ITS RELATION TO VITAMIN D. *(E.)* Norman, A. W. (no affil.). In: *Vitamins and Hormones. Advances in Research and Applications.* edited by Harris, R. S. (New York: Academic Press, 1974).

3848 SULPHATE TRANSPORT BY RAT ILEUM. EFFECT OF MOLYBDATE AND OTHER ANIONS. *(E.)* Cardin, C. J.; Mason, J. (Dep. Biochem., Trinity Coll., Dublin, Ireland). *Biochim. Biophys. Acta* 394(1):46-54, 1975.

3849 INHIBITION OF PYRUVATE TRANSPORT BY FATTY ACIDS IN ISOLATED CELLS FROM RAT SMALL INTESTINE. *(E.)* Lamers, J. M. J.; Hulsmann, W. C. (Fac. Med., Erasmus Univ., Rotterdam, Netherlands). *Biochim. Biophys. Acta* 394(1):31-45, 1975.

3850 NATURE AND IMPORTANCE OF ENDOGENOUS FATTY ACIDS DURING INTESTINAL ABSORPTION OF FATS. *(E.)* Clement, J. (Natl. Cent. Sci. Res., Dijon, France). *World Rev. Nutr. Diet.* 21:281-307, 1975.

3851 EFFECT OF FREE GOSSYPOL ON TISSUE UPTAKE OF IRON BY EVERTED SEGMENTS OF RAT DUODENUM. *(E.)* Herman, D. L.; Smith, F. H. (Dep. Anim. Sci., North Carolina State Univ., Raleigh). *J. Agric. Food Chem.* 23(3):548-551, 1975.

3852 BILIARY EXCRETION AND ENTEROHEPATIC CIRCULATION OF PREGNANOLONE IN THE RAT. *(E.)* Long, R. J.; Soyka, L. F. (Univ. Illinois Coll. Med., Chicago). *Biochem. Pharmacol.* 24(10):1067-1072, 1975.

3853 VITAMIN D: 3-DEOXY-1α-HYDROXYVITAMIN D_3, BIOLOGICALLY ACTIVE ANALOG OF 1α,25-DIHYDROXYVITAMIN D_3. *(E.)* Norman, A. W.; Mitra, M. N.; Okamura, W. H.; Wing, R. M. (Dep. Biochem., Univ. California, Riverside). *Science* 188(4192):1013-1015, 1975.

3854 EFFECT OF NAFENOPIN (SU-13,437) ON LIVER FUNCTION. HEPATIC UPTAKE AND BILIARY EXCRETION OF OUABAIN IN THE RAT. *(E.)* Meijer, D. K. F.; Bognacki, J.; Levine, W. G. (Albert Einstein Coll. Med., Yeshiva Univ., Bronx, N.Y.). *Drug Metab. Dispos.* 3(3):220-225, 1975.

3855 EFFECT OF CALCIUM AND PHOSPHORUS ON FLUORIDE METABOLISM IN MAN. *(E.)* Spencer, H.; Osis, D.; Kramer, L.; Wiatrowski, E.; Norris, C. (VA Hosp., Hines, Ill.). *J. Nutr.* 105(6):733-740, 1975.

3856 SODIUM CHLORIDE TRANSPORT BY RABBIT GALLBLADDER. DIRECT EVIDENCE FOR A COUPLED NaCl INFLUX PROCESS. *(E.)* Frizzell, R. A.; Dugas, M. C.; Schultz, S. G. (Univ. Pittsburgh, Pa.). *J. Gen. Physiol.* 65(6):769-795, 1975.

3857 BILIARY EXCRETION OF [^{3}H]ALDOSTERONE AND ITS SEX DEPENDENCE IN ADRENALECTOMIZED RATS. *(E.)* Morris, D. J.; Silverman, J. A. (Miriam Hosp., Providence, R.I.). *Endocrinology* 96(6):1386-1391, 1975.

3858 CONCENTRATION DEPENDENCE OF ETHANOL. EFFECT ON INTESTINAL ABSORPTION OF THEOPHYLLINE IN RATS. *(E.)* Harrigan, D. J.; Levy, G. (Sch. Pharm., State Univ. New York, Buffalo). *J. Pharm. Sci.* 64(5):897-898, 1975.

3859 BILE ACIDS: THEIR ABSORPTION FROM THE GASTROINTESTINAL TRACT AND ROLE DURING FAT ABSORPTION. *(E.)* Dietschy, J. M. (Univ. Texas Southwest. Med. Sch., Dallas). *Verh. Dtsch. Ges. Inn. Med.* 80:399-407, 1974.

3860 EFFECT OF FASTING AND ANTINEOPLASTIC AGENTS ON THE INTESTINAL ABSORPTION OF DRUGS IN THE RATS. *(E.)* Komuro, T.; Kitazawa, S.; Sezaki, H. (Hosp. Pharm., Kyoto Univ., Japan). *Chem. Pharm. Bull.* 23(2):400-408, 1975.

See also, 3791, 3800, 3877, 4138, 4152, 4153, 5067, 5091.

MOTILITY

3861 EFFECT OF ISCHEMIC ANOXIA ON MYOELECTRICAL AND MECHANICAL ACTIVITY OF THE TOTALLY ISOLATED CANINE STOMACH. *(E.)* Kowalewski, K.; Zajec, S.; Kolodej, A. (Surg.-Med. Res. Inst., Univ. Alberta, Edmonton, Canada). *Surg. Gynecol. Obstet.* 140(2):187-192, 1975.

Electrical and mechanical activities were recorded from the totally isolated canine stomach perfused with homologous blood of a living oxygenator-supported dog. Stagnant ischemic anoxia was induced by closing inflow and outflow blood from the isolated organ for various periods up to 4 hr. Recording of electrical and mechanical activity was performed prior to, during, and after the anoxic periods. After a given period of time, blood was recirculated for 10 min and pentagastrin (5 μg) was injected into the gastric artery. Ischemia induced first low frequency electrical control activity, and it altered the direction of conduction and phase lag of control activity. Contractions, if present prior to ischemia, were abolished after 10-20 min of circulatory arrest. No signals were recorded from electrically active areas of the stomach after 30-50 min of ischemia. After up to 3 hr of anoxia, stomachs showed recordable electrical activity when perfused for 10 min with homologous blood and essentially normal electrical control activity and mechanical activity 10 min after pentagastrin injection. After 3.5-4 hr of anoxia, recirculation of blood and pentagastrin had no effect on electrical and mechanical activity of the gastric musculature. That *ex vivo* canine stomachs can tolerate 3 hr of stagnant ischemia suggests that metabolic function in the smooth muscle cells, responsible for the periodic oscillations in potential, is not irreversibly damaged after this period of ischemia. The response to pentagastrin indicates that functional integrity of the intramural plexus was not destroyed by 3 hr of anoxia and that the nerve plexus layers were still able to synthesize and release acetylcholine.

3862 GASTROESOPHAGEAL DYNAMICS DURING IMMERSION IN WATER TO THE NECK. *(E.)* Johnson, L. F.; Lin, Y. C.; Hong, S. K. (Tripler Army Med. Cent., Honolulu, Hawaii). *J. Appl. Physiol.* 38(3):449-454, 1975.

The gastroesophageal pressure gradient, distal esophageal sphincter pressure, and the gastroesophageal pH gradient were studied in man during immersion to the neck in water, and standing in air with and without abdominal compression. An esophageal pressure probe and pH electrode were passed into the esophagus of five subjects while standing in air. The catheter assembly was advanced in 1 cm increments until all gauges had traversed the distal esophageal sphincter and entered the stomach. The instrument was then withdrawn slowly until the proximal pressure gauge had entered the hypopharynx. During the measurements the subject was encouraged not to swallow. Identical procedures were repeated while the subject was standing in water up to the neck, and was standing in air with a gastric pressure of 20 mm Hg created by a thigh blood pressure cuff around the abdomen. While standing in air, gastric pressure averaged 4.6 mm Hg while the esophageal sphincter pressure was 19.4 mm Hg. The gastroesophageal pressure gradient was 58 mm Hg. During immersion in water, gastric pressure increased to nearly 20 mm Hg and esophageal sphincter to about 32 mm Hg. Esophageal pressure was about 5 mm Hg higher than the corresponding in air measurements, and the point of lowest pressure shifted proximally. While standing in air with abdominal compression, gastric and sphincter pressures were similar to those in immersed subjects, but esophageal pressure was midway between values in immersed subjects and in air subjects. The pH abruptly changed from nearly neutral in the esophagus to strongly acidic as the catheter traversed the sphincter. The location where the pH had been 6 shifted 4 cm proximally during immersion. The esophagus shortened in length between the cricopharyngeus and the upper limit of the sphincter by 11% during immersion and 9.7% during abdominal compression in air. These two values did not differ significantly from each other. Although no evidence of reflux was found, it is suggested that immersion predisposes to gastric reflux in those with low sphincter tone.

3863 EFFECTS OF CAERULEIN ON THE ISOLATED HUMAN ILEUM. *(E.)* del Tacca, M.; Soldani, G.; Crema, A. (Dep. Pharmacol. Univ. Pisa, Italy). *Rend. Gastroenterol.* 6(3):165-167, 1974.

The effects of cerulein on the human intestine *in vitro* was studied using longitudinal strips removed during surgical operations from patients of both sexes. Before beginning the experiments, the preparation was left standing for about 120 min, by which time spontaneous activity had developed; at this time the effectiveness of transmural stimulation was determined with trains of pulses of 1 μsec duration at a frequency of 10/sec lasting for 30 sec. Cerulein produced a pronounced and sustained contraction of the longitudinal muscle, which relaxed after washing. Tachyphylaxis readily occurred. The threshold concentration differed from one organ to another, but in all the experiments cerulein was used at 1×10^{-8} g/ml. In the presence of atropine (5×10^{-7} g/ml), the contraction in response to transmural stimulation was abolished and replaced by a biphasic response. Bradykinin (5×10^{-8} g/ml), used as a reference drug for its direct action on the muscle, was unaffected. Tetrodotoxin (1×10^{-6} g/ml) added in the presence of atropine caused a further but not significant reduction of response to cerulein. The response to bradykinin was not affected by atropine and tetrodotoxin. In the presence of atropine plus tetrodotoxin, the response to cerulein was resumed at higher doses of polypeptide (1×10^{-6} g/ml). Hexamethonium (1×10^{-4} g/ml) reduced the response to cerulein by 25%, while bradykinin was not affected. The results indicate that the effects of cerulein on isolated human ileum are mediated mainly through cholinergic structures because atropine reduces its response. The stimulant effect of cerulein, however, appears to be at least partially independent of the cholinergic nervous system, because neither atropine nor tetrodotoxin completely abolished the contractions. The response to cerulein was only partially affected by hexamethonium, indicating that cerulein stimulates mainly at postganglionic sites. It is suggested that response remaining after atropine and tetrodotoxin is either directly on the smooth muscle cells or mediated through the release of a mediator at the level of the nerve endings.

3864 COMPARATIVE STUDIES ON THE EFFECTS OF BRADYKININ AND VAGAL STIMULATION ON MOTILITY

IN THE STOMACH AND COLON. *(E.)* Fasth, S.; Hulten, L.; Jahnberg, T.; Martinson, J. (Sahlgrenska Hosp., Univ. Goteburg, Sweden). *Acta Physiol. Scand.* 93(1): 77-84, 1975.

The effect of bradykinin on gastric and colonic motility was compared with the effects of vagal nerve stimulation in cats. Eighteen cats were anaesthesized and fitted with volume recording devices which allowed intragastric and intraluminal pressures to be kept constant. Intraaortic bradykinin (10 μg) caused a profound and prolonged gastric relaxation along with a marked and prolonged colonic contraction. The gastric relaxation closely mimicked the atropine resistant relaxation elicited by vagal stimulation. Bradykinin did not reproduce the vagal motility effects on colon smooth muscle but mimicked the atropine resistant expulsive contraction elicited by activiation of the pelvic nerves. The effects were not blocked by anti-adrenergic drugs. The results suggest that the gastric relaxation elicited by intraaortic bradykinin is not caused by an adrenergic mechanism or by a direct ganglion stimulating effect but is due to a direct effect on the gastric smooth muscles; further investigations are suggested to determine whether a kinin-like substance is involved.

3865 ELECTROMYOGRAPHY OF THE SPHINCTER OF ODDI: TECHNIC AND EXPERIMENTAL RESULTS IN THE RABBIT: EFFECT OF CERTAIN DRUGS.

(E.) Sarles, J. C.; Midejean, A.; Devaux, M. A. (Dig. Pathol. Res. Unit, INSERM, Marseille, France). *Am. J. Gastroenterol.* 63(3):221-231, 1975.

Electromyographic tracings of the rabbit sphincter of Oddi *in vivo* (50 rabbits) and *in vitro* (20 rabbits) were described, in addition to the effect of alcohol and various pharmacodynamic agents on the choledochoduodenal junction. Electromyographic activity was recorded by means of bipolar suction electrodes placed on the sphincter of Oddi and the adjacent duodenum. The bile duct was catheterized so that the pressure could be recorded. The sphincteric traces showed basal activity consisting of bursts of 1-8 spike potentials every 3-5 sec accompanied by a transient rise in biliary pressure. The patterns were different from those recorded for the duodenum in which the biliary pressure was not affected. The frequency and amplitude of the spike potentials increased with temperature and the rise in biliary perfusion pressure. Acetylcholine (1.8 mg/kg, i.v.), prostigmin (0.05 mg/kg, i.v.), and morphine hydrochloride (0.4 mg/kg, i.v.) increased the frequency and amplitude of the spike potentials and shortened the resting intervals. Inhaled amyl nitrite and i.v. hexamethonium (2 mg/kg/hr) reduced electrical activity. Atropine (0.2 mg/kg, i.v.) had a very slight depressant effect. Alcohol (1 g/kg) administered as an i.v. drip resulted in a substantial increase in the electrical activity of the sphincter and in biliary pressure. The effect was reduced by vagotomy and suppressed by hexamethonium (1 mg/kg/hr, i.v.) given 30 min before alcohol. The results suggest that the sphincter of Oddi is the site of basal contractile activity, consisting of rhythmic muscular contractions, which prevent the discharge of bile into the duodenum and temporarily raise the pressure in the lower end of the common bile duct.

3866 MOTILITY CHANGES IN THE ANTRUM AFTER PROXIMAL GASTRIC VAGOTOMY.

(E.) Kelly, M.; Kennedy, T. (R. Victoria Hosp., Belfast, Ireland). *Br. J. Surg.* 62(3):215-220, 1975.

The motility of the antrum in the normal animal was studied before and after truncal, selective and proximal gastric vagotomy. The resting and postprandial motor activity in the gastric antrum was observed in 6 dogs using a miniaturized mercury column strain gauge. There was a gradual increase in the amplitude of contraction during the first 2 hr after eating, which was maintained for 3 hr, and then declined For the first 45 min, terminal antral contraction occurred, partially retaining and triturating the gastric contents. After 45 min, the waves became sequential, symmetrical, increased in vigor, and actively pumped food into the duodenum. Truncal and selective vagotomy reduced the work capability to 20% of normal 1 month after operation; the waves were disorganized. Proximal gastric vagotomy abolished the braking mechanism and removed the initial inhibitory stimuli to antral motility. Within 1 month, the antrum regained 58% of its normal work capability and the contractions were well organized. The results indicate that the avoidance of a drainage operation in combination with proximal gastric vagotomy maintains an active and effective pyloric pump which recovers rapidly after operation.

3867 NEURAL ORGANIZATION OF ESOPHAGEAL PERISTALSIS: ROLE OF VAGUS NERVE.

(E.) Mukhopadhyay, A. K.; Weisbrodt, N. W. (Univ. Texas Med. Sch., Houston). *Gastroenterology* 68(3): 444-447, 1975.

A study was undertaken to determine the velocity of peristalsis in the smooth muscle area of the opossum esophagus before and after atropine administration and to evaluate the role of the vagus nerves in controlling the propagation of esophageal peristalsis. Tracheostomies were performed on animals of both sexes and the intraluminal pressures in the esophagus were measured with a pressure transducer recorder system. The velocity of peristalsis in the lower third of the esophagus was measured before and after atropine (100 μg/kg, i.p.) following the induction of swallowing by pharyngeal stimulation. In another group of animals, the vagus nerves were sectioned behind and between the carotid artery and jugular vein, and the esophageal contractions produced by electrical stimulation were measured after i.p. atropine (100 μg/kg) administration. The velocity of peristalsis in the lower third of the esophagus progressively decreased from 3.25 cm/sec to 1.83 cm/sec at the lower esophageal sphincter. After atropine administration, the velocity decreased from 3.1 cm/sec to 1.74 cm/sec at the lower esophageal sphincter; these changes were not significant. Electrical stimulation of the distal cut end of the vagus nerve induced peristaltic contractions, the velocities of peristalsis after electrical stimulation decreasing from 3.24 cm/sec to 1.84 cm/sec at the lower esophageal sphincter. The results indicate that the velocity of peristalsis in the smooth muscle area of the opossum esophagus has a caudally decreasing gradient. Bilateral cervical vagotomy and stimulation of the distal cut end initiated peristaltic contraction, indicating that the propagative nature of peristalsis in the smooth muscle area of the opossum esophagus has a caudally decreasing gradient. Bilateral cervical vagotomy and stimulation of the distal cut end initiated peristaltic contraction, indicating that the propagative nature of peristalsis in the smooth muscle segment of the body of the esophagus is controlled by a local mechanism within the esophagus rather than within the central nervous system.

3868. EFFECT OF VAGOTOMY ON ELECTRICAL ACTIVITY OF THE SMALL INTESTINE OF THE DOG. *(E.)*

Weisbrodt, N. W.; Copeland, E. M.; Moore, E. P.; Kearley, R. W.; Johnson, L. R. (Univ. Texas Med. Sch., Houston). *Am. J. Physiol.* 228(2):650-654, 1975.

The effect of bilateral thoracic vagotomy on the myoelectric activity of the small intestine was studied in conscious male mongrel dogs. The animals were implanted with electrodes spaced 25 cm apart along the serosal surface of the small intestine, and a cannula was placed in the most dependent portion of the stomach. Recordings were made with dogs in fasted and fed states. Two distinct patterns of myoelectric activity were recorded: one typical of the fasted state (the interdigestive myoelectric complex) and one typical of the fed state. After completion of the control recording periods, a truncal vagotomy was performed on each animal. Completeness of the vagotomy was confirmed by lack of a gastric secretory response to insulin. Gastric stasis occurred after vagotomy, so animal stomachs were emptied *via* the gastric cannula to obtain a fasted condition. Vagotomy had little or no effect on the fasted pattern of myoelectric activity, but the fed pattern was significantly altered in 2 animals. This alteration might have been due to the effect of vagotomy on gastrin release. It is concluded that nervous pathways within the vagus may exert some influence on the intestinal myoelectric activity, but that other neural-humoral pathways are probably also involved.

3869 EFFECT OF PROSTAGLANDINS E_1, E_2 AND $F_2\alpha$, AND PENTAGASTRIN ON THE GALLBLADDER PRESSURE IN DOGS. *(E.)*

Nakano, J.; McCloy, Jr. R. E.; Gin, A. C.; Nakano, S. K. (Univ. Oklahoma Coll. Med., Oklahoma City). *Eur. J. Pharmacol.* 30(1):107-112, 1975.

The effects of pentagastrin and prostaglandins E_1 (PGE_1), E_2, (PGE_2), and $F_2\alpha$ ($PGE_2\alpha$) on gallbladder pressure were studied in anesthetized dogs. The gallbladders of 34 dogs were exposed through an upper midline laparotomy. The various drugs were injected into a femoral vein and the effects on gallbladder and systemic arterial pressures monitored continuously. In some animals, the cystic duct was clamped. Both PGE_1 and PGE_2 (4 μg/kg) lowered gallbladder pressure when the initial pressure was higher than 5 mm Hg, but caused no significant change when the initial pressure was lower than 3 mm Hg; both significantly decreased the systemic arterial pressure. In contrast, $PGF_{2\alpha}$ (4 μg/kg) increased systemic arterial and gallbladder pressures regardless of the initial pressure. When the cystic duct was clamped, $PGF_{2\alpha}$ markedly increased gallbladder pressure, while both PGE_1 and PGE_2 increased it only slightly. Furthermore, $PGF_{2\alpha}$ appeared to constrict the sphincter of Oddi, while PGE_1 and PGE_2 relaxed it. Pentagastrin (200 μg/kg) initially decreased then slightly increased systemic arterial pressure and produced a significant monophasic decrease in gallbladder pressure regardless of the initial pressure. Pretreatment with indomethacin did not affect or slightly potentiated the cholecystokinetic effect of the prostaglandins, but abolished that of pentagastrin. The results suggest that gallbladder smooth muscle is markedly stimulated by $PGF_{2\alpha}$ and stimulated to a lesser degree by $PGE_1$and PGE_2. They also suggest that prostaglandins are possible mediators for the cholecystokinetic action of the gastrointestinal hormones.

3870 EFFECTS OF ACETYLCHOLINE RELEASING DRUGS ON ELECTRICAL ACTIVITIES OBTAINED FROM AUERBACH'S PLEXUS IN THE GUINEA PIG ILEUM. *(E.)*

Sato, T.; Takayanagi, I.; Takagi, K. (Fac. Pharm. Sci., Univ. Tokyo, Japan). *Jpn. J. Pharmacol.* 24(3): 447-451, 1974.

The effects of 5-hydroxytryptamine, sodium picrate, cerulein, and pentagastrin on the electical activities in Auerbach's plexus in the guinea pig ileum were studied. The ileal longitudinal muscle with Auerbach's plexus was removed from male animals and suspended in an organ bath filled with Locke-Ringer's solution. The drugs and various antagonists (atropine sulfate, hexamethonium bromide, nicotine bitartrate, and morphine hydrochloride) were injected into the bath and the responses of the tissue recorded using an isotonic lever. At 3×10^{-7} to 3×10^{-6} g/ml, 5-hydroxytryptamine increased the spike frequency in Auerbach's plexus; this was unaffected by pretreatment with atropine, hexamethonium, or nicotine. Sodium picrate (10^{-4} g/ml), cerulein (3×10^{-9} g/ml), and pentagastrin (5×10^{-7} g/ml) also increased the spike frequency, their effects similarly being little affected by atropine or hexamethonium. Tachyphylaxis was observed following repeated administration of pentagastrin at 10^{-6} g/ml, and large spikes were often simultaneously recorded with 5-hydroxytryptamine, cerulein, pentagastrin, and sodium picrate. The large spikes were inhibited by atropine and Mn^{++}, but not by tetrodotoxin. Morphine reduced the frequency of the single spikes elicited by 5-hydroxytrypamine as well as the 5-hydroxytryptamine-induced contraction of the isolated longitudinal muscle strip; morphine had a similar effect on the responses elicited by cerulein. The results suggest that the sites of action of these agonists are in Auerbach's plexus and that the agonists modify to a minimum extent the electrical activities of Auerbach's plexus *via* muscarinic and nicotinic receptors. Furthermore, these agonists probably accelerate the release of acetylcholine and contract the ileum.

3871 MECHANICAL RESPONSES TO CATECHOLAMINES IN ISOLATED STRIPS OF THE GUINEA-PIG STOMACH MUSCLE.

(E.) Yamaguchi, T.; Tomita, T. (Fac. Med., Kyushu Univ., Fukuoka, Japan). *Jpn. J. Pharmacol.* 24(6):911-922, 1974.

The effects of various catecholamines on the mechanical responses caused by electrical stimulation of excitatory and inhibitory nerves in the guinea pig stomach were studied. Strips of circular and longitudinal muscle from animals of both sexes were suspended in organ baths containing Krebs solution. Epinephrine hydrochloride, tetrodotoxin citrate, norepinephrine hydrochloride, isoproterenol hydrochloride, phentolamine mesylate, propranolol hydrochloride, and hyoscine butylbromide were injected into the organ baths, the blockers being applied 10-15 min prior to catecholamine application. The preparations were stimulated between two Ag-AgCl electrodes placed at opposite ends of the bath. In the circular muscles, the relaxation and biphasic response elicited by epinephrine and norepinephrine were partially suppressed by phentolamine and propranolol; the catecholamine-induced relaxation in the longitudinal muscles was inhibited by propranolol. α-Relaxation was more dominant in the circular muscles, while β-relaxation was more dominant in the longitudinal muscles. The contractions in both muscle types were mediated *via* α-effects, but the circular muscle was more sensitive to the α-effect while the longitudinal muscle was more sensitive to the β-effect. In the presence of propranolol, isoproterenol caused a monophasic contraction or a biphasic response in both circular and longitudinal muscle. The inhibition of the electrically evoked contractions by epinephrine and norepinephrine was abolished by phentolamine in both muscle types, but the electrically evoked relaxations were little affected. The data suggest that the suppressive action of the catecholamines is probably due to the prevention of acetylcholine release by activation of the α-receptors in the cholinergic nerves. The suppression of evoked contractions by isoproterenol was probably due to a direct action on the muscle rather than an effect on nervous elements.

3872 EFFECTS OF GASTROINTESTINAL HORMONES ON VASCULAR SMOOTH MUSCLE.

(E.) Fara, J. W. (Health Sci. Cent., State Univ. New York, Stony Brook). *Am. J. Dig. Dis.* 20(4):346-353, 1975.

The effects of secretin and cholecystokinin (CCK) on the mechanical activity of the rat portal vein were investigated and compared with those of isoproterenol, theophylline, and cyclic and dibutyryl cyclic AMP (cAMP). Thirty-three portal veins from male and female rats were mounted in Krebs-solution baths containing the various drugs being tested; some of the solutions contained 4-5 times the normal potassium ion concentration. Boots secretin (0.03-0.60 U/ml), pure natural secretin (0.18-0.60 U/ml), and CCK (0.12-0.60 U/ml) elicited dose-dependent decreases in the amplitude and simultaneous increases in the frequency of the spontaneous venous contractions. These effects were mimicked by isoproterenol theophylline, and cAMP. All agents tested were also effective in reducing potassium- or norepinephrine-induced tension. In addition, subthreshold doses of CCK and secretin elicited responses when given in combination, and the effects of the hormones at all dose levels were potentiated by theophylline. The mechanical responses to secretin, CCK, and isoproterenol were unaffected by atropine and phenoxybenzamine, and only the response to isoproterenol was blocked by propranolol. The data indicate that secretin and CCK have a direct inhibitory effect on rat portal vein activity and that this effect is not mediated through α- or β-adrenergic or cholinergic receptors. They also suggest that CCK, secretin, and isoproterenol exert their action on the portal vein through a cAMP mechanism. At least a part of the mechanism of hormone-induced mesenteric vasodilatation may involve a direct relaxing effect of the hormones on the vascular smooth muscle.

3873 A RAPID PULL-THROUGH TECHNIQUE FOR MEASURING LOWER ESOPHAGEAL SPHINCTER PRESSURE.

(E.) Dodds, W. J.; Miller, W. N.; Lydon, S. B.; Arndorfer, R. C. (Med. Coll. Wisconsin, Milwaukee). *Gastroenterology* 68(3):437-443, 1975.

Measurement of lower esophageal sphincter pressure by rapid pull-through technique was compared with that by conventional station pull-through technique. Twenty-four studies were performed on 12 normal volunteers using a 5-lumen catheter assembly. Sphincte pressure was measured by the conventional method, in which the catheter radial recording tips were withdrawn through the sphincter in 0.5 cm increments wit a 10-sec pause at each station, and the rapid method, in which the sensors were withdrawn manually at 0.5 -1.0 cm/sec during a 10-15 sec interval of suspended respiration. Two complete sets of studies were done 2-4 wk apart. First-study results from each subject were scored independently by different observers on 2 separate occasions, while those of the second study were scored once only by each observer. Intraobserver and interobserver scoring errors were calculated, and a variance analysis was done. In the 1st study, differences in intraobserver error were small, but were significantly less in the rapid technique (0.3) than the standard (1.3). Interobserver scoring error was greater for results from the standard technique than the rapid. Scoring errors were not sufficient to obscure pressure differences between subjects. Variance between intrasubject pull-throughs was significantly greater for standard (10.0-6.6 mm Hg) than for rapid (7.3-4.3 mm Hg) techniques. Data from the first and second studies showed pressures calculated from the rapid method to be slightly greater than those from the standard method (24.3 and 21.1 mm Hg, resp)--a significant difference. Calculation from either method correlated significantly between studies. It is concluded that intraobserver and interobserver scoring errors are less for recorded and calculated pressure obtained by the rapid method; the sphincter-gastric pressure gradient is slightly greater when calculated from the rapid method; and calculated pressure is reproducible for both methods.

3874 PLASMA CATECHOLAMINES AND POSTOPERATIVE GASTRIC EMPTYING AND SMALL INTESTINAL PROPULSION IN THE RAT.

(E.) Dubois, A.; Henry, D. P.; Kopin, I. J. (Natl. Cancer Inst., Bethesda, Md.). *Gastroenterology* 68(3):466-469, 1975.

The role of the adrenal medullary discharge of catecholamines in the inhibition of gastric emptying and small intestinal propulsion after laparotomy was examined using male Sprague-Dawley rats. Fasted demedullated and sham-demedullated rats were anesthetized and the small intestine and colon exteriorized, wrapped in gauze, and replaced after 30 min. Twelve hr later, 2 ml of a ^{51}Cr-labeled liquid test meal were administered *via* gastric tube and the rates of gastric emptying and propulsion of the meal into the distal small intestine were determined. The concentration of plasma catecholamines was determined by an enzymatic assay. Fourteen days after adrenal demedullation, the plasma catecholamine levels were significantly lower than in the sham-demedullated animals. Twelve hr after exteriorization of the small intestine, there was a significant increase in the plasma catecholamine levels of the sham-demedullated rats but not the demedullated rats. Gastric emptying before and after exteriorization of the intestine occurred at the same rate in the demedullated and sham-operated rats. Similarly, the 2 groups did not differ in the rate of small intestinal propulsion after a test meal; in both groups, the rate of transfer of the intestinal contents to the distal portion of the intestine was significantly retarded 12 hr after intestinal exteriorization. The results indicate that *in vivo*, circulating catecholamines have only a minor influence on gastric emptying and intestinal propulsion of a test meal.

3875 MODIFICATION OF 5-HT ACTION BY MAGNESIUM IONS ON THE GUINEA PIG ILEUM.

(E.) Singh, G. (Lady Hardinge Med. Coll., New Delhi, India). *Jpn. J. Pharacol.* 24(4):639-640, 1974.

The effects of different perfusion media on the responses of the guinea pig ileum to 5-hydroxytryptamine (5-HT) were studied. Ileal segments from mongrel guinea pigs were perfused with Tyrode's solution or mammalian Ringer's solution. Of 10 pieces of intestine from different animals, seven showed tachyphylaxis to 5-hydroxytryptamine when perfused with Tyrode's solution; the height of the contractions were increased substantially by placing the segments in the Ringer's medium. Subsequently, the action of graded doses of 5-hydroxytryptamine was studied in ileal segments perfused with Ringer's solution to which $MgCl_2$ had been added. $MgCl_2$ (1-2 x 10^{-4} g/ml) reduced or completely blocked the response to all doses of 5-hydroxytryptamine; it also reduced the response of the ileal segments to histamine. 5-Hydroxytryptamine failed to contract segments of depolarized guinea pig ileum perfused with K_2SO_4-Ringer's solution to which $CaCl_2$ had been added. The results suggest that 5-hydroxytryptamine may make calcium available for the contractile machinery of the guinea pig ileum by a process of depolarization. Antagonism between 5-hydroxytryptamine and magnesium may be secondary to an antagonism between calcium and magnesium.

3876 LOCAL SPECIALIZATION AT ILEOCECAL JUNCTION OF THE CAT AND OPOSSUM.

(E.) Conklin, J. L.; Christensen, J. (Univ. Hosp., Univ. Iowa, Iowa City). *Am. J. Physiol.* 228(4):1075-1081, 1975.

Characteristics which distinguish the ileocecal junction of the opossum from that of the cat were studied in 10 mature animals of each species. Serial 2-mm-wide transverse strips of muscularis propria were prepared from samples of ileum and colon taken from the region 1.5 cm above and about 1.5 cm below the ileocecal mucosal junction. These strips were separately stretched to determine the relation between length and tension and were separately subjected to electrical field stimulation. Anatomically, there was a thickening of the circular muscle layer in the ileal wall above the ileocolic mucosal junction in the cats but not in the opossums. In most cases the ileal strips of both species relaxed during electrical field stimulation, with tension returning to basal levels at the ends of the trains. This fall in basal tension during the stimulus train was seldom seen in the colonic strips of either species. All reponses to electrical field stimulation were abolished by tetrodotoxin (3 x 10^{-7} M) in the opossum and in the cat (3 x 10^{-6} M). In both species, the length-tension slopes were greatest just above the ileocecal junction where stimulus relaxation occurred. Tetrodotoxin (3 x 10^{-7} M) raised the basal tension in the ileal strips in both species and in the colonic strips only in the cat. The data indicate that the ileocecal junction muscle resembles that of the esophagogastric and gastroduodenal junctions in its relatively high degree of resistance to stretch and prominent neurogenic stimulus relaxation. However, in contrast to these other junctions, the ileocecal junction also possesses a tonic inhibitory innervation. The ileocecal junction appears to be characterized by a control system which differs from the systems of the ileum above and the colon below the junction.

3877 EFFECTS OF GASTROINTESTINAL HORMONES ON GASTROINTESTINAL MOTILITY AND ABSORPTION.

(Ger.) Soergel, K. H. (Med. Coll. Wisconsin, Milwaukee). *Verh. Dtsch. Ges. Inn. Med.* 80:385-392, 1974.

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3892 NEUROPHYSIOLOGY OF AUERBACH'S PLEXUS AND CONTROL OF INTESTINAL MOTILITY. *(E.)* Wood J. D. (Univ. Kansas Med. Cent., Kansas City). *Physiol. Rev.* 35(2):307-324, 1975.

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3898 ANTIPERISTALTIC INTESTINAL SEGMENTS: EXPERIMENTAL AND CLINICAL STUDY. *(Fr.)* Dauchel, J.; Schang, J. C.; Sava, G.; Jaeck, D.; Grenier, J. F. (no affil.). *Rev. Fr. Gastroenterol.* (102):63-64, 67-70, 1974.

3899 COLONIC AND SMALL INTESTINAL RESPONSE TO INTRAVENOUS PROSTAGLANDIN $F_{2\alpha}$ AND E_2 IN MAN. *(E.)* Milton-Thompson, G. J.; Cummings, J. H.; Newman, A.; Billings, J. A.; Misiewicz, J. J. (R. Nav. Hosp., Gosport, England). *Gut* 16(1):42-46, 1975.

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3903 PHARMACOLOGY OF COLONIC MUSCLE. *(E.)* Bennett, A. (King's Coll. Hosp. Med. Sch., London, England). *Gut* 16(4):307-311, 1975.

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3907 ANTAGONISM OF ADENOSINE 5'-TRIPHOSPHATE-INDUCED RELAXATION BY 2-2'-PYRIDYLISATOGEN IN THE TAENIA OF GUINEA-PIG CAECUM. *(E.)* Spedding, M.; Sweetman, A. J.; Weetman, D. F. (Sch. Pharm., Sunderland Polytech., Germany). *Br. J. Pharmacol.* 53(4):575-583, 1975.

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See also, 4377, 4506, 4530.

SECRETION AND METABOLISM

3911 THE INFLUENCE OF SYMPATHETIC ACTIVITY AND ISOPRENALINE ON THE SECRETION OF AMYLASE FROM THE HUMAN PAROTID GLAND. *(E.)* Speirs, R. L.; Herring, J.; Cooper, W. D.; Hardy, C. C.; Hind, C. R. K. (London Hosp. Med. Coll., England). *Arch. Oral Biol.* 19(9):747-752, 1974.

3912 EFFECT OF CATECHOLAMINE ANALOGS ON THE GLYCOGEN CONCENTRATION IN MOUSE PAROTID GLAND--RELATIONSHIP TO ADENOSINE 3',5'-MONOPHOSPHATE LEVELS AND INCREASED DEOXYRIBONUCLEIC ACID SYNTHESIS. *(E.)* Durham, J. P.; Butcher, F. R. (Dep. Biochem., Univ. Glasgow, Scotland). *Biochem. Pharmacol.* 24 (8):920-922, 1975.

3913 AGING AND ENZYMATIC CHANGES IN RAT PAROTID GLAND TISSUE. *(Ger.)* Chilla, R.; Arglebe, C.; Arold, R. (Otorhinolaryngol. Clin., Univ. Gottingen, Germany). *Acta Otorhinolaryngol. Belg.* 206 (4):311-317, 1974.

3914 ON RHYTHMICAL VARIATION OF THE PROTEIN CONTENT IN CELLS OF INTRALOBULAR DUCTS OF THE RAT PAROTID GLAND. *(Rus.)* Nechaeva, N. V.; Fateyeva, V. I. (Inst. Dev. Biol., USSR. Acad. Sci., Moscow). *Tsitologiya* 16(8):1033-1036, 1974.

3915 EFFECT OF VAGOTOMY AND PYLOROMYOTOMY ON THE ACTIVITY OF DUODENAL, COLONIC AND SPLENIC HYDROLYTIC ENZYMES IN RAT. *(Pol.)* Wesolowski, H.; Snop, S. (Inst. Histol. Embryol., Szcecin). *Pol. Tyg. Lek.* 29(48):2077-2080, 1974.

3916 ISOLATION AND IDENTIFICATION OF PROSTAGLANDIN E_2 FROM THE GASTROINTESTINAL TRACT OF SHARK Triakis scyllia. *(E.)* Ogata, H.; Nomura, T. (Lab. Marine Biochem., Tohoku Univ., Sendai, Japan). *Biochim. Biophys. Acta* 388(1):84-91, 1975.

3917 STUDIES ON DEGRADED CARRAGEENAN IN RATS AND GUINEA-PIGS. *(E.)* Grasso, P.; Gangolli, S. D.; Butterworth, K. R.; Wright, M. G. (Br. Indust. Biol. Res. Assoc., Carshalton, England). *Food Cosmet. Toxicol.* 13(2):195-201, 1975.

3918 EFFECT OF ISOPRENALINE INFUSION ON GASTROINTESTINAL SECRETION IN THE ANESTHETIZED RAT. INTERACTION WITH PROPRANOLOL. *(Fr.)* Dupont, C.; Jean, E.; Wepierre, J. (Pharm. Cent., Chatenay-Malabry, France). *Biol. Gastroenterol. (Paris)* 7(4): 298-299, 1974.

3919 CHEMOSENSITIVE VAGAL ENDINGS IN THE OESOPHAGUS OF THE CAT. *(E.)* Harding, R.; Titchen, D. A. (Dep. Physiol., Univ. Melbourne, Victoria, Australia). *J. Physiol. (Lond.)* 247(1):52P-53P, 1975.

See also, 3822.

SECRETION AND METABOLISM

Stomach

3920 EFFECTS OF PREDNISONE ON GASTRIC SECRETION AND DEVELOPMENT OF STOMACH LESIONS IN SWINE. *(E.)* Zamora, C. S.; Kowalczyk, T.; Hoekstra, W. G.; Grummer, R. H.; Will, J. A. (Dep. Vet. Sci., Univ. Wisconsin, Madison). *Am. J. Vet. Res.* 36(1): 33-39, 1975.

The effects of prednisone on ulceration and gastric secretion was studied in crossbred weanling pigs. The pigs were treated for 19 days with i.m. saline or i.m. prednisone (10, 20, 40, 80, or 160 mg/day); all animals were also treated i.m. with a long-acting antibiotic preparation. In the second experiment, the gastric contents were collected from five pigs with simple gastric fistulas both before and during treatment with prednisone (10 mg/kg, i.m.). In the first experiment, the prednisone-treated pigs developed pathologic changes in the glandular region of the stomach, primarily in the fundic area and occasionally in the pyloric and cardiac mucosas. The characteristic lesion was hemorrhagic gastritis, which was associated with massive gastric hemorrhages in the animals given the larger doses of prednisone. Epithelial changes were observed in the esophageal area, but there were no ulcers. In the animals with gastric fistulas, administration of prednisone for 8 days produced a significant increase in the volume and acidity of the gastric secretion. In addition, the hexosamine output, but not its concentration, increased significantly during the treatment period. Prednisone did not produce an immediate change in gastric secretion; there was a latent period of 1-2 days before marked changes were observed. Peak changes were seen around the third or fourth day, after which the acidity of the gastric secretion gradually decreased to pretreatment levels. The results indicate that although increased acidity may be involved in the development of lesions in the glandular region of the stomach, other factors probably also have a role in the pathogenesis of steroid-induced stomach lesions in swine.

3921 THE INFLUENCE OF FOOD CONSUMPTION AND RUNNING ACTIVITY ON THE ACTIVITY-STRESS ULCER IN THE RAT. *(E.)* Pare, W. P. (VA Hosp., Perry Point, Md.). *Am. J. Dig. Dis.* 20(3):262-273, 1975.

The extent to which food consumption and running activity contribute to the development of the activity-stress ulcer was studied in male ARS/Sprague-Dawley rats. In the first experiment, rats housed in activity cages were exposed to a daily 1-hr feeding schedule; control animals in standard cages were food yoked to the activity rats. A similar procedure was followed in the second experiment, in which both activity and control groups contained naturally active and less active animals, and in the third experiment, in which the rats' normal light-dark cycle was reversed. In the fourth experiment, rats representing three different age groups, and presumably three activity levels, were exposed to the activity-stress situation. In the first experiment, the rats housed in the activity cages died within 21 days and developed extensive ulcers in the glandular stomach; the food-yoked controls did not die and remained ulcer-free. Rats demonstrating high running activity levels under *ad libitum* feeding conditions subsequently developed a higher incidence of ulcers than low-activity rats when exposed to the activity-stress situation. Attempts to attenuate activity and lesion incidence by reversing the light-dark schedule failed, but a higher mortality level in rats under the reversed light-dark condition was related to higher activity levels in these animals. In the fourth experiment, young rats with a high activity levels died sooner and developed more ulcers than older rats with low activity levels. These results suggest that running activity, and not reduced food intake, was critically involved in the development of the activity-stress ulcers in these experiments.

3922 THE EFFECTS OF BURIMAMIDE AND METIAMIDE ON GASTRIC SECRETION IN THE CONSCIOUS CAT.

(E.) Harris, D.; Smy, J. R.; Reed, J. D.; Venables, C. W. (Sch. Pharm., Sunderland Polytech., England). *Agents Actions* 4(5):311-313, 1974.

The effects of burimamide and metiamide on gastric acid secretion were studied in 10 cats with cannulated gastric fistulas. In four experiments, burimamide (2 mg/kg, i.v.), metiamide (4 mg/kg, i.m.), burimamide plus metiamide, and pentagastrin (6 μg/kg) were injected into the conscious animals; the gastric acid output was measured every 15 min. Burimamide significantly increased acid secretion over basal levels, the maximal increase occurring within 30 min of injection. Metiamide, on the other hand, had no significant effect on acid secretion. Although acid output was increased following the administration of burimamide plus metiamide, the response was significantly lower than that to burimamide alone. The total acid output in response to burimamide was only 18.5% of that observed in response to pentagastrin. These results suggest that burimamide has a partial agonistic action which is not shared by metiamide.

3923 BA^{++} ON THE RESTING FROG STOMACH: EFFECTS ON ELECTRICAL AND SECRETORY PARAMETERS.

(E.) Rangachari, P. K. (Univ. California Sch. Med., San Francisco). *Am. J. Physiol.* 228(2):511-517, 1975.

The effects of Ba^{++} on the electrical and secretory activities of the resting frog stomach were studied. Gastric mucosae from bullfrogs were bathed in nutrient solutions containing potassium penicillin, streptomycin sulfate, KCl, histamine acetylcholine, NaSCN, and/or $BaCl_2$ (0.1-2.0 mM). Low chloride solutions were prepared using glucuronic acid titrated with NaOH to neutral pH. Ba^{++} added to the nutrient solution increased resistance, decreased the potential difference, and stimulated acid secretion in comparison to stomachs bathed in normal solutions. Under short-circuit conditions, the increase in the acid secretory rate was accompanied by a decrease in short-circuit current. These changes were reversed by NaSCN (10 mM), suggesting that Ba^{++} had not impaired the current-generating mechanism *per se*. Histamine-induced acid secretion was associated with an increase in net Cl$^-$ flux, particularly the forward flux (N→S). Ba^{++} increased acid secretion with no increase in the forward flux, but with a decrease in the net Cl$^-$ flux. Histamine, in the presence of Ba^{++} and low-Cl$^-$ solutions, increased acid secretion and transmucosal resistance, suggesting the operation of a neutral pump in the secretion of HCl. The results suggest that Ba^{++} affects the movement of Cl$^-$ across the tissue and induces a competition for Cl$^-$ between the acid-secreting and current-generating mechanisms at the luminal surface.

3924 EFFECT OF ANTRECTOMY AND SUBSEQUENT VAGOTOMY ON THE SERUM GASTRIN RESPONSE TO FOOD IN DOGS.

(E.) Booth, R. A. D.; Reeder, D. D.; Thompson, J. C. (Univ. Texas Med. Branch, Galveston). *Ann. Surg.* 181(2):191-195, 1975.

The food-stimulated release of extra-antral gastrin was studied in mongrel dogs with denervated fundic Heidenhain pouches. Serum gastrin concentrations and acid secretion from the Heidenhain pouches were measured after an 18-hr fast and every 15 min for 3 hr following the ingestion of a 200 g meat meal. The dogs were then subjected to antrectomy, with gastrointestinal continuity restored by means of a Billroth I gastroduodenal anastomosis or a Billroth II gastro-jejunostomy. The effect of food on serum gastrin and gastric acid secretion was again measured 3 weeks later. A few days later, some of the dogs were subjected to bilateral truncal vagotomy; the food studies were repeated 3 weeks afterward. Serum gastrin was measured by radioimmunoassay. In all dogs, antrectomy significantly depressed the mean basal levels of serum gastrin and abolished the rise in serum gastrin shown by intact animals in response to a meat meal. Food-induced pouch acid secretion was also significantly lowered by antrectomy. Vagotomy after antrectomy increased the basal levels of serum gastrin, but did not restore the serum gastrin response to a meal. The results suggest that biologically active forms of gastrin are released from the antrum in response to food, while biologically inactive basal levels of gastrin apparently originate from extra-antral sources. The post-vagotomy increase in basal (static) gastrin suggests vagal control of the metabolism of static, extra-antral gastrin.

3925 ELECTROPHYSIOLOGIC RESPONSES OF THE CANINE GASTRIC MUCOSA TO ENDOTOXIN, EPINEPHRINE, AND HEMORRHAGE.

(E.) Chou, A. C.; Jacobson, E. D.; Shanbour, L. L. (Univ. Texas Med. Sch., Houston). *Circ. Shock.* 2(1):13-20, 1975.

The early electrophysiologic responses of an epithelial membrane were measured during endotoxin and hemorrhagic shock using an *in vivo* canine stomach preparation. A segment of the oxyntic gland area of the stomach was exposed in fasted mongrel dogs of both sexes. The potential difference across the stomach was monitored with a pair of calomel electrodes. In some animals, the LD_{100} dose of endotoxin (6 mg/kg) was given as a rapid i.v. bolus (group II) or by intra-arterial infusion (group III). In group IV, oligemic shock was induced by removal of blood from the femoral artery, and group V was given epinephrine (1 μg/kg/min) directly into the gastric artery for 10 min. In a second experiment, the effects of phentolamine (2.3 mg/kg given as 2 boluses and by continuous infusion) on the potential difference after endotoxin was studied. In the third experiment, the effect of endotoxin and aminopyrine (given at 20 mg/kg loading dose and subsequent infusion at a rate of 5 mg/kg/hr) clearance from the gastric mucosal flap was measured. Given as a bolus, endotoxin caused an immediate decrease in the potential difference and an increase in the equivalent electrical resistance across the stomach; the same dose of endotoxin given as a continuous infusion produced no such changes. Oligemic shock and epinephrine had similar effects to those produced by the endotoxin bolus. The decrease in potential difference and increase in equivalent electrical resistance produced by endotoxin were blocked by phentolamine, and endotoxin produced an increase in the gastric mucosal blood flow as determined by aminopyrine clearance. The results suggest that the effect of endotoxin on the electrophysiology of the gastric mucosa is mediated primarily through the release of epinephrine, which acts directly on the active transport processes rather than through the induction of gastric mucosal ischemia.

3926 INTERACTION OF SECRETIN AND CARBAMINOYLCHOLINE ON GASTRIC SECRETION IN CATS. *(E.)*

Vagne, M.; Perret, G. (INSERM, Edouard-Herriot Hosp., Lyon, France). *Digestion* 11(3/4):215-225, 1974.

Acid, pepsin, and gastric mucus secretion were studied during stimulation with a cholinergic, secretin, and a combination of both in three cats equipped with a gastric fistula and a Heidenhain pouch. Gastric secretion from both the gastric fistula and Heidenhain pouch was collected for three 1-hr periods following experiments using carbaminoylcholine (10 μg/kg for first hr, 20 μg/kg for second hr), synthetic secretin (0.5 U/kg for first hr, 3 U/kg for second hr), and a combination of these. Carbaminoylcholine slightly stimulated acid secretion and strongly stimulated pepsin and mucus secretion using determinations of uronic acid as representative of polysaccharides and fucose as representative of glycoproteins. Synthetic secretin induced a small stimulation of pepsin, uronic acid, and fucose secretions. Secretin added to cholinergic stimulation decreased the acid response and increased pepsin and mucus responses. The results suggest that, in cats, fundic mucus secretion is under both cholinergic and hormonal control.

3927 INHIBITION OF GASTRIC ACID SECRETION IN THE RAT BY ORALLY-ADMINISTERED SYNTHETIC PROSTAGLANDIN ANALOGUES: ENANTIOMORPHS OF 15-HYDROXY-15-METHYL-9-OXOPROSTANOIC ACID. *(E.)*

Lippman, W. (Biochem. Pharmacol. Dep., Ayerst Lab., Montreal, Canada). *J. Pharm. Pharmacol.* 26(10):831-833, 1974.

The effects of orally-administered enantiomorphs of 15-hydroxy-15-methyl-9-oxoprostanoic acid (AY-22469) on basal gastric acid secretion and on the incidence of diarrhea were studied in mice and rats. The synthetic prostaglandin racemate AY-22469 inhibited basal gastric secretion with an ED$_{50}$ of 4.3 mg/kg. The *ent*-isomer was similarly active with a parallel log dose-response curve, while the *nat*-isomer was 2.8-fold less effective than the *ent*-isomer with a parallel log dose-response curve. There was no effect on the volume of gastric juice produced. In mice, AY-22469 at a dose level up to 240 mg/kg caused diarrhea in 13% of the animals; at a similar dose level, the incidence of diarrhea was 25% with the *ent*- and *nat*-isomers. In rats, AY-22469 caused diarrhea with an ED$_{50}$ of 120 mg/kg. The antisecretory activity of AY-22469 and the enantiomorphs appears to be due to their action on the acid concentration; cyclic adenosine-3',5'-monophosphate may be involved in this action. AY-22469 and its enantiomorphs may be useful therapeutic agents for the treatment of gastric hypersecretion and peptic ulcers.

3928 ALTERATIONS IN SECRETORY PATTERNS FOLLOWING ANTRECTOMY IN RATS WITH PAVLOV POUCHES.

(E.) Lundell, L. (Inst. Physiol., Univ. Lund, Sweden
J. Physiol. (Lond.) 245(3):737-754, 1975.

The gastric secretory response to various stimuli was studied in conscious female Sprague-Dawley rats provided with Pavlov pouches. The antrum was also removed in some rats, gastrointestinal continuity being reestablished by an end-to-end gastroduodenostomy. The maximal acid secretory capacity was 60% lower in the antrectomized than in the intact Pavlov pouch rats 3 weeks after surgery; the difference increased with time as the maximal capacity of the intact animals increased. Antrectomy also reduced the interdigestive secretion of acid. Acid secretion in response to i.v. pentagastrin infusion (maximal dose 8 μg/hr for 6 hr) was reduced by about 50% 3 weeks after antrectomy and by about 65% after 6 weeks. The antrectomized and intact rats did not differ in this respect, however, when the responses were related to the maximal secretory capacity. The dose-response curve to paentagastrin revealed a reduced responsiveness to submaximal doses of this agent, following antrectomy. The maximal acid secretory response to i.v. histamine (15.625-2000 μg/hr) was also reduced after antrectomy, although the sensitivity to submaximal infusions of histamine appeared to be increased. The mean secretory output in response to 2-deoxy-D-glucose (50 mg/kg, i.v.) was reduced by about 65%, and that to food (2-3 gm standard pellet diet) was reduced by about 85% following antrectomy. After antrectomy, a background infusion of pentagastrin enhanced the secretory response to 2-deoxy-D-glucose and food, but did not restore the responses to the levels seen in the intact rats. The feeding responses as related to the maximal secretory capacity were, however, similar in both groups when pentagastrin was infused into the antrectomized animals. The interdigestive secretion of pepsin was reduced by about 60% after antrectomy, while the peak response to 2-deoxy-D-glucose was about twice the interdigestive level in both groups. The food-stimulated increase in pepsin secretion was of longer duration in the antrectomized rats. The results suggest that the reduction in maximal acid secretory capacity after antrectomy is due primarily to a parietal cell hypoplasia, and that the functional performance of the parietal cells is altered after antrectomy to a degree that the response to methacholine plus histamine is not a true gauge of the maximal secretory capacity.

3929 DECREASED INCIDENCE OF INDOMETHACIN-INDUCED GASTRIC ULCERATION IN RATS BY BILE DUCT DIVERSION. *(E.)* Abtahi, F. S.; Djahanguiri, B. (Fac. Med., Univ. Tehran, Iran). *Br. J. Surg.* 62(2): 113-114, 1975.

The effect of bile drainage into different sites in the small bowel on the incidence of indomethacin-induced gastric ulceration was studied in male and female Sprague-Dawley rats. The fasted animals were left unoperated, sham-operated, or fitted with a cannula inserted into the bile duct; the other end of the cannula was inserted into the small bowel 0, 2.5, 5, 7.5, or 10 cm distal to the ampulla of Vater. The animals were then infused i.p. with saline or indomethacin (40 mg/kg) in saline solution. The stomachs were examined for signs of ulceration 4 hr later. Indomethacin produced ulceration in 100% of the unoperated and sham-operated animals. In the operated rats in which the cannula had been inserted 0, 2.5, 7.5, and 10 cm from the ampulla of Vater, indomethacin produced 100, 80, 50, 30, and 10% ulceration, resp. The incidence of indomethacin-induced ulceration was significantly reduced in the latter three groups of operated rats compared with the unoperated, sham-operated, and operated rats in whom the cannula was inserted 0 cm from the ampulla of Vater. The results show that the exclusion of bile reflux from the stomach prevents the appearance of indomethacin-induced gastric ulceration in fasted rats. They suggest that bile reflux plays an as yet undetermined role in the pathogenesis of indomethacin-induced gastric ulceration in rats.

3930 LIPOATE EFFECT ON CARBOHYDRATE AND LIPID METABOLISM AND GASTRIC H$^+$ SECRETION. *(E.)* Harris, J. B.; Alonso, D.; Park, O. H.; Cornfield, D.; Chacin, J. (San Francisco Gen. Hosp., Calif.). *Am. J. Physiol.* 228(3):964-971, 1975.

Some of the factors regulating the use of carbohydrates and lipids as energy sources by frog gastric mucosa were examined. Acid secretion and oxygen consumption were measured in the gastric mucosa of *Rana catesbeiana* following treatment with pyruvate, thiamine, thiamine pyrophosphate, lipoate, glucose, lactate, histamine, and/or various fatty acids. Both acid secretion and oxygen consumption by the mucosae were sharply stimulated by lipoate; this was followed by a rapid decline to below control values. Glucose or lactate alone had no effect on either parameter, and pyruvate alone caused only a slight stimulation of oxygen consumption. However, treatment of lipoate-treated mucosae with any of these compounds increased the stimulatory effect of the lipoate and markedly slowed the rate of decline subsequent to maximum stimulation. Various fatty acids had a moderate-to-large stimulatory effect on both acid secretion and oxygen consumption. However, lipoate pretreatment decreased the stimulatory effect of butyrate by 56%, that of decanoate by 87%, and that of palmitate by 60%; propionate became an inhibitor in the presence of lipoate. Lipoate also increased oxidation of exogenously supplied fatty acids compared to the levels seen in the absence of exogenous substrate. Lipoate-treated mucosae did not respond to histamine, but the addition of glucose restored responsiveness. The results indicate that the β-oxidation of fatty acids plays a major role in the acid secretory process and that it is centrally involved in the previously reported stimulation of acid secretion by cyclic AMP and histamine.

3931 CHEMICAL STIMULATORY MECHANISM IN GASTRIC SECRETION. *(E.)* Cieszkowski, M.; Konturek, S. J.; Obtulowicz, W.; Tasler, J. (Med. Acad., Krakow, Poland). *J. Physiol. (Lond.)* 246(1):143-157, 1975.

The effects of bovine serum albumin, pepsin-digested albumin, an amino acid mixture, liver extract, and mannitol (control) on the serum gastrin level, gastric mucosal blood flow, and acid secretion from the Heidenhain pouch were measured in three mongrel dogs. Distention of the Heidenhain pouch with mannitol or albumin (particularly pepsin-digested albumin) at pH 5.0 produced similar pressure-related increases in acid secretion, reaching a peak of only 10% of the maximal response to histamine. The highest acid output (about 80% of the maximal response to histamine) was obtained with liver extract; an amino acid mixture containing all essential amino acids stimulated acid secretion to a lesser degree. In no case did the secretions from gastric or pancreatic fistulas or the serum gastrin level change from basal values. I.v. atropine (100 μg/kg/hr) and irrigation of the pouch with 50 ml of 0.1% atropine or 2% xylocaine solution significantly depressed the pouch response to liver extract; irrigation with 0.5% acetylcholine did not affect the response, and i.v. urecholine (10 μg/kg/hr) increased the response. The pouch response to chemical stimulation by peptic digests was greatly potentiated by combining this with distention of the oxyntic gland area. When the pH of the liver extract in the Heidenhain pouch was gradually decreased from 5.0 to 1.0, there was a concomitant decrease in acid secretion and in the mucosal blood flow, both falling to the basal level at pH 1.0. Exogenous secretin given in graded doses from 0.5-8.0 U/kg/hr caused a small, dose-related inhibition of the acid response to liver extract and an increase in the mucosal blood flow; there was no significant change in the serum gastrin level. The results suggest that the products of protein digestion, polypeptides and free amino acids, are potent chemical stimulants of acid secretion from the oxyntic gland area. The stimulation of this area by peptic digests induces acid secretion by a local, gastrin-independent, partially neural reflex mechanism which is sensitive to pH, pressure, and secretin.

3932 CIRCADIAN PLASMA GASTRIN PATTERNS IN FEEDING AND FASTING MAN. *(E.)* Moore, J. G.;

Wolfe, M. (Univ. Utah Coll. Med., Salt Lake City). *Digestion* 11(3/4):226-231, 1974.

The effects of feeding and fasting on the circadian pattern of plasma gastrin concentrations were studied in human volunteers. Basal gastric acid collections were obtained every 24-hr from healthy male adults. The hourly secretory pattern, which described a circadian rhythm, was compared to serial plasma gastrin levels in subjects who underwent 24-hr gastric intubation and aspiration, subjects who ate and exercised freely, and subjects who fasted but were unintubated. A circadian rhythm of plasma gastrin levels was observed only in subjects who ate and exercised freely. The results confirm previous findings that the circadian pattern of gastric acid secretion is unrelated to plasma gastrin levels and support the belief that the circadian rhythm of plasma gastrin levels is a result of the effects of feeding on antral gastrin release.

3933 PENTAGASTRIN INCREASES PHENYLALANINE AND DECREASES HISTADINE INCORPORATION INTO PROTEINS OF RAT STOMACH. *(E.)* Evans, D. C.; Lin, T. M. (Res. Lab., Eli Lilly Co., Indianapolis, Indiana). *Res. Commun. Chem. Pathol. Pharmacol.* 10(3):597-600, 1975.

The action of pentagastrin on the incorporation of [^{14}C] L-phenylalanine and [^{14}C] L-histidine into the stomach and duodenum proteins of rats was studied. Sixty female rats were treated with [^{14}C] L-phenylalanine or [^{14}C] L-histidine (20 μCi/kg, i.p.) 1 hr before receiving pentagastrin (250 μg/kg, s.c.). One hr after injection of pentagastrin the incorporation of [^{14}C] L-phenylalanine into the proteins of the squamous and fundic portions of the stomach was significantly increased by 18% and 17.5%, resp. The uptake of [^{14}C] L-histidine into the proteins was significantly decreased in the squamous region (-24%), fundic region (-18%), and duodenal region (-16%). Incorporation of histidine and phenylalanine into the proteins of the pylorus was not significantly affected. The results support the view that gastrin plays a dual role on gastric function: a trophic action to enhance protein synthesis; and a stimulating action on histidine metabolism favoring histamine production.

3934 DOES HISTAMINE HAVE TWO VASODILATOR ACTIONS ON THE GASTRIC MUCOSA? *(E.)* Reed, J. D.; Sanders, D. J. (Med. Sch., Univ. Newcastle upon Tyne, Engalnd). *Agents Actions* 5(1):1-3, 1975.

Oxygen consumption and extraction were measured during gastric stimulation with histamine and gastrin pentapeptide to determine whether there is an extra mucosal blood flow component in addition to that linked to parietal cell activity. Gastric activity was stimulated by histamine (45 μg/kg, i.v.) in three cats and by pentapeptide (2 μg/min) in five. Samples of gastric venous blood were taken at the rate of 1 ml/min; hemoglobin concentration and % oxygen saturation were measured. Steady state conditions were ensured by taking values obtained between 30 and 60 min from start of stimulation. During gastrin pentapeptide stimulation, there was significantly less mucosal blood flow/U H$^+$ compared to the histamine responses. Oxygen consumption was dependent upon acid secretion in a similar way for both histamine and gastrin stimulation. The degree of oxygen extraction from the gastric circulation was significantly less during histamine stimulation than during gastrin stimulation. The results support the hypothesis that histamine causes a vasodilatation in the gastric mucosa in two ways, a direct dilator action and one associated with secretory activity.

3935 PEPSIN OUTPUT AFTER DISRUPTION OF THE HUMAN GASTRIC MUCOSAL BARRIER BY TAUROCHOLI ACID. *(E.)* Ivey, K. J.; Parsons, C. (R. Prince Alfred Hosp., Sydney, Australia). *Am. J. Dig. Dis.* 20(4):362-364, 1975.

Pepsin output in man was studied after the gastric mucosal barrier was altered by taurocholic acid. Test solutions containing 10 mM taurocholic acid in 160 mM HCl were instilled into the stomachs of five healthy volunteers. Significant back diffusio of H$^+$ and exsorption of Na$^+$ occurred, but there was no significant increase in pepsin output compared to control studies using HCl alone. The results show that 160 mM HCl increases pepsin output in man but altering the gastric mucosal barrier with taurocholic acid in 160 mM HCl does not produce any greater output of pepsin.

3936 EVIDENCE FOR OXYNTOPYLORIC REFLEX FOR RELEASE OF ANTRAL GASTRIN. *(E.)* Debas, H. T.; Walsh, J. H.; Grossman, M. I. (VA Wadsworth Hosp. Cent., Los Angeles, Calif.). *Gastroenterolog* 68(4):687-690, 1975.

The effect of distention of the vagally innervated oxyntic gland area on the release of gastrin from the vagally innervated pyloric gland area was studied in dogs. Three dogs were prepared with vagally innervated pouches of both the oxyntic gland area and the pyloric gland area (antrum). When the antral pouch was filled but not distended with 0.1 M NaHCO$_3$, graded distention of the oxyntic pouch caused graded increases in serum gastrin and graded increases in acid secretion from the oxyntic pouch. When the antral pouch was filled with 0.1 M HCl, graded distention of the oxyntic pouch evoked no increase in serum gastrin and the acid responses from the oxyntic pouch were much smaller than when the antrum was alkaline. The results support the hypothesis that distention of the oxyntic gland area initiates an oxyntopyloric reflex that causes release of gastrin from the pyloric gland area.

3937 EFFECTS OF INTRADUODENAL AMINO ACIDS, FATTY ACIDS, AND SUGARS ON SECRETIN CONCENTRATIONS. *(E.)* Boden, G.; Essa, N.; Owen, O. E. (Temple Univ. Health Sci. Cent., Phila., Pa.). *Gastroenterology* 68(4):722-727, 1975.

The effects of amino acids, fatty acids, and iso- and hypertonic solutions of sugars on serum concentrations of immunoreactive secretin (IRS) were studied in 21 anesthetized dogs. The test substances, an 8.5% amino acid mixture, a 50 mM Na oleate solution, an oleic acid bile mixture, 5% fructose, 40% sucrose, and 9% NaCl solutions were infused intraduodenally at constant rates. HCl (160 mM) was infused at the end of most experiments to demonstrate responsiveness of the animals. Infusion of amino acids, Na oleate, the oleic acid bile mixture, and 5% fructose all failed to significantly change portal or femoral venous IRS concentrations. NaCl (9%) caused a slight depression; 40% sucrose caused a slight increase in IRS concentrations; however, neither change was statistically significant. HCl significantly increased portal and femoral venous IRS concentration and was the only substance that increased pancreatic flow and bicarbonate excretion. The results suggest that oleic acid, amino acids, fructose, and hypermolar solutions at the concentrations tested have no major effect on IRS release; HCl is the only physiological substance shown to reproducibly promote secretin secretion.

3938 THE EFFECT OF CARBENOXOLONE ON CHANGES IN CANINE AND HUMAN GASTRIC MUCOSA CAUSED BY TAUROCHOLATE AND ETHANOL. *(E.)* Gordon, M. J.; O'Brien, P.; Skillman, J. J.; Silen, W. (Harvard Med. Sch., Boston, Mass.). *Surgery* 77(5):707-714, 1975.

The effect of carbenoxolone on gastric mucosal permeability was studied in canine gastric pouches and in healthy human subjects; its effect on ethanol- and taurocholate-induced changes was also determined. Three dogs were prepared with an antrectomy and a vagally denervated gastric pouch. Perfusion of the canine pouches with sodium taurocholate (40 mM) was associated with an increase in H+ back diffusion. The effect was not diminished by 10 days of carbenoxolone treatment. A significant increase of gastric mucosal permeability was observed in six normal human subjects after instillation of ethanol (20% v/v). After 3 weeks of oral ingestion of carbenoxolone, there was inconsistent protection against ethanol-induced increases in gastric mucosal permeability. Basal secretion of H^+ and post-ethanol H^+ secretion appeared to be diminished by carbenoxolone. The results suggest that carbenoxolone does not protect against taurocholate- and ethanol-induced increases in gastric mucosal permeability in the dog or in man and that its beneficial effect on gastric ulcer is by a mechanism other than prevention of H^+ back diffusion.

3939 THE ROLE OF BILE REFLUX IN THE DEVELOPMENT OF COLD-RESTRAINT GASTRIC LESIONS. *(E.)* Meeroff, J. C.; Paulsen, G.; Guth, P. H. (VA Wadsworth Hosp. Cent., Los Angeles, Calif.). *Am. J. Dig. Dis.* 20(4):365-369, 1975.

The role of bile reflux in the development of gastric mucosal lesions during cold-restraint stress was studied in the rat. Sprague-Dawley rats (40) were randomized into four groups: one underwent sham operations with no cold-restraint stress; the other three were subjected to cold-restraint stress for 3 hr following sham operations, pyloric ligation, or bile duct ligation. The stomachs were then removed and the severity of lesions recorded; hematocrit readings were made on blood from the hearts. The mean lesion scores of all groups exposed to cold-restraint stress were similar but much higher than those of the unrestrained sham-operated group. Mean hematocrit readings in all groups exposed to cold-restraint stress were lower than in the control group. There was a moderate correlation between severity of mucosal lesions and hematocrit reading. The results suggest that bile reflux is not necessary for formation of cold-restraint stress lesions in the rat and that hematocrit readings may be useful in measuring blood loss secondary to experimental mucosal lesions.

3940 SIGNIFICANCE OF LOCAL CIRCULATORY DISTURBANCE IN THE EXPERIMENTAL PRODUCTION OF GASTRIC ULCER. *(E.)* Sekine, T.; Shiratori, T. (Tohoku Univ. Sch. Med., Sendai, Japan). *Tohoku J. Exp. Med.* 114(2):121-130, 1974.

The relation between experimental production of gastric ulcer and local circulatory disturbance was investigated in dogs by ligating gastric vessels accompanied with or without histamine injection. Dogs (62) were divided into five groups and the following observations made in each group: macroscopic findings of the gastric mucosa; microscopic findings of ulcer; incidence of production of ulcers; and acid secretory response to histamine. Gastric ulcers were similar to those seen in humans except for little regeneration of mucosa or proliferation of connective tissue at the base and margin of the ulcer. The incidence of gastric ulcers was extremely high in groups having had both histamine administration (50 mg histamine dihydrochloride in beeswax, i.m.) and gastric vessel ligation compared with groups having had only histamine. Gastric acid secretion in response to histamine also showed a fall in free acidity and a marked decrease in volume after ligation of gastric vessels. The results suggest that decrease in mucosal resistance induced by ligation of gastric vessels, rather than gastric acid secretion, may play an important role as an etiologic factor in the production of gastric ulcers.

3941 EFFECT OF HYPNOTIC SUGGESTION OF RELAXATION ON BASAL AND BETAZOLE-STIMULATED GASTRIC ACID SECRETION. *(E.)* Stacher, G.; Berner, P.; Naske, R.; Schuster, P.; Bauer, P.; Starker, H.; Schulze, D. (Psychiatric 1st Surg. Clin., Univ. Vienna, Austria). *Gastroenterology* 68(4):656-661, 1975.

The effect of relaxation suggestion in hypnosis on basal and betazole stimulated gastric acid secretion was examined in four healthy female volunteers (21-24 yr-old) susceptible to hypnosis. Acid output was measured by intragastric titration and a pH-sensitive telemetry capsule. Three series of experiments, each lasting 3 hr, were carried out: (1) after 1 basal hr, administration of 1.7 mg/kg betazole s.c.; 2) after the basal hr, administration of saline s.c. and induction of hypnosis; relaxation was suggested for 1 hr, after which posthypnotic amnesia was suggested and the subject awakened; and 3) procedure as in experiment 2 but 1.7 mg/kg betazole s.c. instead of saline. Each subject underwent two of each series. A completely crossed 4-factorial analysis of variance, accounting for treatment, time, replication, and subject factors was performed. Suggestion of relaxation in hypnosis resulted in a significant reduction of unstimulated (2.16 mEq/15 min) as well as betazole-stimulated (0.62 mEq/15 min) acid secretion and in a decrease of gastric motility. Both effects were reversed after the termination of hypnosis. It is suggested that these effects originate in the central nervous system and are mediated *via* an alteration of the stimulating and/or inhibiting tone of the autonomic nervous system.

3942 GASTRINS IN HUMAN ANTRUM, DUODENUM AND PERIPHERAL CIRCULATION.

(E.) Vinik, A. I.; Grant, B. J.; Novis, B. (Dep. Med., Univ. Cape Town, South Africa). *S. Afr. Med. J.* 49(8):255-257, 1975.

The nature of the gastrins extracted from human antrum, duodenum, and peripheral circulation was studied using blood samples and biopsy specimens from 3 patients. The major form of gastrin found in the pyloric antrum was the heptadecapeptide form; the duodenum contained primarily high-molecular weight gastrin (MW 3,900) and almost no heptadecapeptide gastrin. Fasting serum samples contained mostly high-molecular weight gastrin. The results, in conjunction with previous observations that arginine-stimulated gastrin is comprised of mostly the heptadecapeptide and the lower molecular weight forms, suggest that stimulated gastrin is derived mainly from the pyloric antrum and that the large molecular series are produced by G cells; specific local cleavage processes then determine the nature of gastrin released.

3943 THE INFLUENCE OF HYPERCALCEMIA ON GASTRIC SECRETION AND SERUM GASTRIN CONCENTRATION IN INTACT AND THYRO-PARATHYROIDECTOMIZED RATS.

(E.) Johansson, H.; Krause, U.; Nilsson, F.; Lundqvist, G. (Univ. Hosp., Uppsala, Sweden). *Ups. J. Med. Sci.* 79(3):161-163, 1974.

Gastric acidity and serum gastrin concentration were measured in thyro-parathyroidectomized (14) and sham-operated (14) rats after calcium infusion. Calcium was given in a dose of 2.6 mg/100 g in 0.5 ml administered by continuous infusion at 0.1 ml/min. Plasma gastrin and calcium concentrations were determined 15, 30, 60, 90, and 120 min after the start of the calcium infusion. Gastric juice was collected between 0-2 and 2-4 hr. A moderate H^+ decrease, and unchanged Cl^- concentration and plasma gastrin level were demonstrated in both experimental groups. Although calcium may increase the release of gastrin in man, the results of these experiments showing no change in the serum gastrin concentration after calcium infusion led to the conclusion that such a mechanism does not exist in the rat.

3944 DIRECT INHIBITION OF GASTRIC ACID AND PEPSIN SECRETION BY GROWTH-HORMONE RELEASE-INHIBITING HORMONE IN CATS.

(E.) Gomez-Pan, A.; Reed, J. D.; Albinus, M.; Shaw, B.; Hall, R.; Besser, G. M.; Coy, D. H.; Kastin, A. J.; Schally, A. V. (Dep. Med., Univ. Newcastle upon Tyne, England). *Lancet* 1(7912):888-890, 1975.

The inhibitory action of growth-hormone release-inhibiting hormone on acid and pepsin secretion stimulated by pentagastrin was studied in six conscious cats prepared with gastric fistulas at least 1 yr earlier and compared with the inhibition of food-stimulated acid secretion. On separate days each animal was infused for 60 min with growth-hormone release-inhibiting hormone (10 μg/kg/min) starting 15 min before the s.c. injection of pentagastrin (6 μg/kg) or the ingestion of food, and continuing for 45 min. Gastric juice was collected throughout the period and for 75 min. Growth-hormone release-inhibiting hormone inhibited gastric acid and pepsin secretion in response to pentagastrin and food stimulation in cats. This effect was mediated by a direct action on the parietal and peptic cells. No evidence of a post-inhibitory acid or pepsin secretory rebound was obtained. A compound of hypothalamic origin, then, can exert a direct effect on exocrine secretion. It is suggested, in view of its widespread actions and its presence in relatively high concentrations in various organs apart from the hypothalamus, that growth-hormone release-inhibiting hormone, in addition to its action as a hypothalamic regulatory hormone, might also be responsible for local coordination of endocrine and exocrine secretion.

3945 DIRECT INHIBITION OF GASTRIC ACID BY GROWT HORMONE RELEASE-INHIBITING HORMONE IN DOGS

(E.) Barros D'Sa, A. A. J.; Bloom, S. R.; Baron, J. H. (R. Postgrad. Med. Sch., London, England). *Lancet* 1(7912):886-887, 1975.

To determine if growth-hormone release-inhibiting hormone has any direct action on gastric acid production independent of its effect on gastrin release cyclic growth-hormone release-inhibiting hormone was infused at a rate of 20 μg/kg/hr into four dogs with gastric fistulas. Gastric acid output fell sharply in response to three stimuli of acid production: a meal; and pentagastrin (0.1 μg/kg/hr) and histamine (0.5 μg/kg/hr) infusions. During a 2-hr infusion of growth-hormone release-inhibiting hormone after a meat meal, gastric acid was totally inhibited in each dog with some return of secretion after stopping the infusion. Pentagastrin-stimulated acid production was inhibited 97% by growth-hormone release-inhibiting hormone infusion and histamine-stimulated acid secretion was inhibited 71%. Recovery of acid secretion to almost pre-growth-hormone release-inhibiting hormone levels was seen by the end of the 3rd hr. The fact that acid output was inhibited during pentagastrin administration suggests that growth-hormone release-inhibiting hormone has a direct effect on the gastric parietal cell.

3946 INTESTINAL PHASE OF GASTRIC ACID SECRETION: AUGMENTATION OF MAXIMAL RESPONSE OF HEIDENHAIN POUCH TO GASTRIN AND HISTAMINE. *(E.)* Debas, H. T.; Slaff, G. F.; Grossman, M. I. (VA Wadsworth Hosp. Cent., Los Angeles, Calif.). *Gastroenterology* 68(4):691-698, 1975.

A study was conducted to determine whether serum gastrin increases during the intestinal phase of gastric acid secretion, to investigate the interactions of the intestinal phase with histamine and with endogenous and exogenous gastrin, and to examine the effect of vagotomy on these interactions. In four antrectomized dogs with gastric fistulas and Heidenhain pouches, a liver extract solution of $NaHCO_3$ as control was infused into the gastric fistula for 6 hr. During the last 2 hr, a maximal dose of either pentagastrin (8 µg/kg/hr) or histamine (80 µg/kg/hr), or saline as control, was given i.v. The studies were repeated after truncal vagotomy. Liver extract alone caused a small Heidenhain pouch response but produced no rise in serum immunoreactive gastrin. Intestinal perfusion with liver extract augmented the maximal Heidenhain pouch response to pentagastrin three-fold before and two-fold after vagotomy. The maximal Heidenhain response to histamine was augmented 1 1/2 fold both before and after vagotomy. In another group of three dogs provided with antral pouches, gastric fistulas, and Heidenhain pouches, infusion of liver extract into the gastric fistula produced a similar augmentation of the Heidenhain pouch maximal response to endogenous gastrin released by antral distention with liver extract. It is concluded that liver extract releases entero-oxyntin from the intestine, a hormone capable of augmenting the maximal Heidenhain pouch responses to both gastrin and histamine, that this hormone is distinct from gastrin, that vagotomy does not abolish its release, and that its release by food in the intestine accounts for the greater maximal Heidenhain pouch response to a meal than to exogenous gastrin.

3947 MODEL FOR ISOLATED GASTRIC CELLS TO STUDY THE ENZYMATIC MECHANISM INVOLVED IN ACID SECRETION. *(Fr.)* Lewin, M.; Cheret, A. M.; Grelac, F.; Soumarmon, A.; Ghesquier, D.; Girodet, J. (Bichat Hosp., Paris, France). *Biol. Gastroenterol. (Paris)* 7(4):295-296, 1974.

3948 DIALYSIS STUDIED OF GASTRIC JUICE. *(Rus.)* Rogozina, E. M.; Ryss, E. S.; Dikaia, L. F. (Leningrad Sci. Res. Inst. Radiol. Hyg., USSR). *Lab. Delo* (3):135-136, 1975.

3949 GASTRIC ACID SECRETION IN THE LIZARD. IONIC REQUIREMENTS AND EFFECTS OF INHIBITORS. *(E.)* Hansen, T.; Slegers, J. F. G.; Bonting, S. L. (Dep. Physiol. Biochem., Univ. Nijmegen, Netherlands). *Biochim. Biophys. Acta* 382(4):590-608, 1975.

3950 A METABOLIC BASIS FOR INEFFICIENT HCl SECRETION. *(E.)* Sernka, T. J. (Louisiana State Univ. Med. Cent., Shreveport). *Physiol. Chem. Phys.* 7(1):77-78, 1975.

3951 COMPARITIVE STUDIES OF PEPSIN AND ACID SECRETION IN RATS GIVEN VARIOUS GASTROINTESTINAL HORMONES. *(Ger.)* Schmidt-Wilcke, H. A.; Nawrath, G. D. (St. Franzikus Hosp., Munster, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:528-530, 1974.

3952 HORMONAL INHIBITION OF GASTRIC AND PANCREATIC SECRETION. *(Ger.)* Dotevall, G. (Med. Clin., Univ. Goteborg, Sweden). *Verh. Dtsch. Ges. Inn. Med.* 80:380-385, 1974.

3953 INHIBITION OF GASTRIC SECRETION IN MAN BY ORAL ADMINISTRATION OF CALCITONIN. *(Ger.)* Hotz, J.; Goebell, H.; Minne, H.; Ziegler, R. (Cent. Intern. Med. Pediatr., Univ. Ulm, Germany). *Z. Gastroenterol.* 12(Suppl.):420-421, 1974.

3954 CALCITONIN AND GASTRIC SECRETION: THE DIFFERENT EFFECTS OF CALCITONIN ON GASTRIC ACID AND PEPSIN SECRETION DURING STIMULATION WITH PEPTAGASTRIN, BETAZOLE, AND INSULIN HYPOGLYCEMIA. *(Ger.)* Hotz, J.; Goebell, H.; Minne, H.; Ziegler, R. (Dep. Intern. Med., Univ. Ulm, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:523-526, 1974.

3955 BLOOD PRESSURE AND HEART RATE AFTER MAXIMAL STIMULATION OF GASTRIC SECRETION WITH PENTAGASTRIN IN SUBJECTS WITH NORMAL BLOOD PRESSURES. *(Ger.)* Merguet, P.; Ewers, H. R.; Brouwers, H. P. (Med. Clin., Univ. Essen, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:561-564, 1974.

3956 CHOLINERGIC SENSITIZATION OF THE OXYNTIC GLANDS TO GASTRIN. *(Fr.)* Dubrasquet, M.; Svensson, S. O.; Emase, S. (Karolinska Hosp., Stockholm, Sweden). *Biol. Gastroenterol. (Paris)* 7(4):294-295, 1974.

3957 EFFECTS OF ANTICHOLINERGIC AGENTS ON GASTRIC SECRETION STIMULATED BY PENTAGASTRIN INFUSION. *(E.)* Laudano, O. M.; Aparicio, N. J. (Centenario Hosp., Rosario Med. Sch., Argentina). *Tijdschr. Gastroenterol.* 17(1):7-16, 1974.

3958 THE EFFECT OF HISTAMINE H_2-RECEPTOR BLOCKADE WITH METIAMIDE ON SERUM GASTRIN LEVELS IN MAN. *(E.)* Barbezat, G. O.; Grant, B.; Bank, S.; Vinik, A. (Dep. Med., Univ. Capetown, South Africa). *Gut* 16(3):186-187, 1975.

3959 ISOLATION OF PEPSIN FROM GASTRIC JUICE OF DOGS. *(Ukr.)* Matsuy, S. P.; Svystun, T. I.; Zahorodneva, A. H.; Guly, M. F. (A. V. Palladin Inst. Biochem., Kiev, USSR). *Ukr. Biokhim. Zh.* 46 (6):782-784, 1974.

3960 FUNCTIONAL CONDITION OF THE STOMACH AND ITS GASTRIN CELLS. *(Rus.)* Buletsa, V. I,; Zheltvai, V. V.; Langazo, Z. P. (Uzhgorod Branch, Odessa Inst. Balneother., USSR). *Fiziol. Ah. SSSR* 61(2):298-300, 1975.

3961 REGULATION OF GASTRIC AND EXTRAGASTRIC RELEASE OF GASTRIN. *(Ger.)* Hausamen, T. U.; Fritsch, W. P.; Rick, W.; Kleybrink, H.; Schact, U. (1st Med. Clin A, Univ. Dusseldorf, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:518-520, 1974.

3962 CHANGES IN THE LEVEL OF BLOOD GASTRIN AFTER THE REMOVAL OF THE ANTRAL MUCOSA. *(Rus.)* Erspamer, V.; Melchiorri, P.; Soprantci, Ch.; Impeta, D.; Rosova, E. I. (Inst. Med. Pharm., Univ. Rome, Italy). *Fiziol. Zh. SSSR* 61(3):433-436, 1975.

3963 TISSUE UPTAKE OF LABELED GASTRIN (^{125}I OR ^{3}H) IN THE GASTRECTOMIZED RAT. *(Fr.)* Dubrasquet, M.; Millat, B. Accary, J. P.; Gislon, J.; Morgat, J. L.; Girma, J. P. (Bichat Hosp., Paris, France). *Biol. Gastroenterol. (Paris)* 7(4):298, 1974.

3964 KINETIC ANALYSIS OF THE EFFECT OF GASTRIN ON THE PROLIFERATION OF PARIETAL AND CHIEF CELLS. *(Fr.)* Willems, G.; Lehy, T. (Bichat Hosp., Paris, France). *Biol. Gastroenterol. (Paris)* 7(4):296-297, 1974.

3965 INHIBITION OF ACID AND GASTRIN RESPONSE TO FEEDING BY ATROPINE IN CATS. *(E.)* Emas, S.; Svensson, S. O.; Dorner, M.; Kaess, H. (Karolinska Hosp., Stockholm, Sweden). *Acta Hepatogastroenterol. (Stuttg.)* 22(1):59-60, 1975.

3966 THE SIGNIFICANCE OF THE APPEARANCE OF GASTRIN IN ANTRAL PERFUSATES FROM DOGS. *(E.)* Andersson, S. Nilsson, G. (Dep. Pharmacol., Karolinska Inst., Stockholm, Sweden). *Acta Hepatogastroenterol. (Stuttg.)* 22(1):64, 1975.

3967 THE EFFECT OF 15 (R) 15 METHYL PGE$_2$ METHYL ESTER ON SERUM GASTRIN LEVELS IN MAN. *(E.)* Adaikan, G. P.; Salmon, J. A.; Karim, S. M. M. (Kandang Kerbau Hosp., Univ. Singapore). *J. Int. Res. Commun.* 2(9):1587, 1974.

3968 DOUBTFUL ROLL [SIC!] OF ENDOGENOUS GASTRIN IN CHICKEN GASTRIC SECRETION BY VAGAL STIMULATION. *(E.)* Kokue, E.; Hayama, T. (Dep. Vet. Sci., Fac. Agric., Tokyo Univ. Agric. Technol., Japan). *Experientia* 31(2):197-198, 1975.

3969 ABO BLOOD GROUPS AND SERUM GASTRIN. *(E.)* Mazzacca, G.; Budillon, G.; De Marco, F.; Carrella, M.; Cimino, L. (2nd Sch. Med., Univ. Naples, Italy). *Acta Hepatogastroenterol. (Stuttg.)* 22(1):44-46, 1975.

3970 ADENYLATE CYCLASE AND PHOSPHODIESTERASE IN RAT GASTRIC MUCOSA. *(E.)* Ruoff, H. J.; Sewing, K. F. (Dep. Pharmacol., Univ. Tubingen, Germany). *Acta Hepatogastroenterol. (Stuttg.)* 22(1):63-64, 1975.

3971 CHANGES IN ACETYLCHOLINESTERASE ACTIVITY IN THE STOMACH OF A VAGOTOMIZED RAT. *(It.)* Lise, M.; Perrino, G.; Cordioli, G. P. (Inst. Clin. Gen. Surg. Surg. Ther., Univ. Padua, Italy). *Chir. Gastroenterol.* 8(2):131-136, 1974.

3972 STUDIES ON GASTRIC ACID SECRETION USING AN ISOLATED WHOLE MAMMALIAN STOMACH IN VITRO. *(E.)* Parsons, M. E. (Smith Kline French Lab., Ltd., Welwyn Garden City, England). *J. Physiol. (Lond.)* 247(1):35P-36P, 1975.

3973 IMMUNOREACTIVE GASTRIN VARIANTS IN CAT SERUM *(E.)* Blair, E. L.; Grund, E. R.; Lund, P. K.; Reed, J. D.; Sanders, D. J. (Med. Sch., Univ. Newcastle upon Tyne, England). *J. Physiol. (Lond.)* 247(1):33P-34P, 1975.

See also, 3887, 3988, 4376, 4439, 4488, 4495, 4496, 4500, 4504, 4505.

SECRETION AND METABOLISM

Pancreas

3974 PURIFICATION AND PROPERTIES OF SUBUNITS OF STEROL ESTER HYDROLASE FROM RAT PANCREAS. *(E.)* Calame, K. B.; Gallo, L.; Cheriathundam, E.; Vahouny, G. V.; Treadwell, C. R. (George Washington Univ. Med. Cent., Washington, D.C.). *Arch. Biochem. Biophys.* 168(1):57-65, 1975.

A procedure for the purification of subunits of sterol ester hydrolase and the results of studies concerning the nature of the interaction of enzyme subunits with cholic acid and its taurine conjugate were described. Subunits of sterol ester hydrolase from rat pancreas were solubilized by treatment of tissue homogenate with 0.5% digitonin. The crude, solubilized enzyme subunit was shown to have a molecular weight of approximately 70,000 by Sephadex G-200 gel filtration. The subunit was purified 500-fold by a combination of ammonium sulfate fractionation, hydroxylapatite, and gel-filtration chromatography. The subunits had been shown to aggregate in the presence of cholic acid or sodium taurocholate to a 400,000 molecular-weight form, which is the active enzyme. Three types of differential inactivation studies (thermal, guanidine hydrochloride, and pH) indicated significantly greater stability of the active enzyme when compared to the subunits. The data support the tentative conclusion that a conformational change or series of changes accompanies the binding of the bile salt to the enzyme subunits, which results in their aggregation and enzyme activity.

3975 IN VITRO STUDIES ON INTERACTION OF RAT PANCREATIC LIPASE AND COLIPASE WITH BILIARY LIPIDS.

(E.) Lairon, D.; Nalbone, G.; Domingo, N.; Lafont, H.; Hauton, J.; Julien, R.; Rathelot, J.; Canioni, P.; Sarda, L. (Res. Group. Lipid Transp., INSERM, Marseilles, France). *Lipids* 10(4):262-265, 1975.

The interaction of lipase with biliary lipids was studied in the presence and absence of colipase. Rat pancreatic juice and bile were collected separately by cannulation, and rat pancreas was homogenized and centrifuged. The supernatant and the collected pancreatic juice were gel filtered, and the lipase and colipase fractions separated out. Rat bile (1.0 ml containing 3 mg/ml phospholipid) was mixed with either 0.1 ml of the lipase fraction (300 enzyme U), 1.2 ml of the colipase fraction (445 cofactor U); or 0.1 ml lipase and 1.0 ml colipase. The mixtures were stirred for 2 hr and filtered through a gel column. Lipase activity was determined at pH 9.0 and bile phospholipids were extracted with chloroform-methanol, and the phosphorus content estimated. When lipase was mixed with bile, the major part of the enzyme was eluted at 2.3 void volumes, and very little activity was associated with the phospholipids that emerged at 2.0 void volumes. A large portion of colipase was associated with these phospholipids, however. When both lipase and colipase were mixed with bile, the major enzyme activity was associated with the phospholipids in a high molecular weight complex including colipase. It is concluded that colipase is present in the complex formed by lipase with biliary or pancreatic lipids, that colipase is essential for the formation of the high molecular weight form of the enzyme, and for the attachment and function of lipase at interfaces.

3976 STUDIES ON DISPERSED PANCREATIC EXOCRINE CELLS. II. FUNCTIONAL CHARACTERISTICS OF SEPARATED CELLS.

(E.) Amsterdam, A.; Jamieson, J. D. (Rockefeller Univ., New York, N.Y.). *Cell Biol.* 63(3):1057-1073, 1974.

Functional characteristics of guinea pig pancreatic exocrine cells isolated by a procedure described in a previous paper by the same authors were assessed by studying the ability of the cells to synthesize, transport, and concentrate exportable proteins into zymogen granules and to release the sorted products in response to secretogogues. The ability of isolated cells to incorporate labeled amino acids ([^{14}C] leucine) into secretory proteins was assessed biochemically and by quantitative electron microscope autoradiography. Incorporation remained linear for up to 4 hr incubation at levels equivalent to those of pancreatic slices and ranged from 1,700-2,000 nM leucine/mg DNA. Over 95% of the exocrine cells in the population were viable, and all appeared to be equally active in incorporating amino acids. The capacity of separated cells to transport, concentrate, and store exportable proteins was monitored by electron microscope autoradiography on populations pulse labeled with [^{3}H]leucine and chase incubated for periods up to 4 hr. The same overall pathway previously mapped in pancreatic slices was followed by secretory proteins in separated cells, although in quantitative studies a defect was noted in the rate of conversion of condensing vacuoles to zymogen granules. Secretogogue responsiveness was assessed by monitoring discharge of labeled secretory proteins or of amylase in response to carbamylcholine and cerulein. While the separated cells released secretory proteins linearly for up to 4 hr in response to both secretogogues, the net release was about 50% less than that previously noted for pancreatic slices and required a 10 times higher concentration of stimulant. The defect may represent alteration in receptors due to the protease used for dissociation. It is concluded that separated exocrine cells retain their ability to process secretory proteins stepwise and vectorially which is consistent with preservation of structural polarity and that these cells should prove useful and satisfactory for a number of studies not requiring prolonged incubation times. The system, however, exhibits a number of defects including those related to inefficient concentration of proteins in condensing vacuoles, suboptimal response to secretogogues, and a slow decay with time as evidenced by loss of DNA from the system.

3977 THE EFFECT OF ELECTRICAL VAGAL STIMULATION ON CANINE PANCREATIC EXOCRINE FUNCTION.

(E.) Kaminski, D. L.; Ruwart, M. J.; Willman, V. L. (Dep. Surg., St. Louis Univ., Mo.). *Surgery* 77(4): 545-552, 1975.

The effect of electrical vagal stimulation on the canine pancreatic exocrine function was studied in conscious dogs by stimulating intact thoracic vagus nerves, the distal ends of cut vagus nerves in animals with intact gastric denervation, and the distal ends of cut vagus nerves in dogs whose stomachs had previously been selectively denervated. The dogs were fasted for 18 hr prior to each experiment, and during the experiments they received i.v. NaCl solution; gastric and pancreatic secretions were collected and measured every 15 min. Electrical stimulation of intact vagus nerves produced no significant change in the pancreatic output, the bicarbonate output, output of the secretin-stimulated pancreas, or protein output. Stimulation of both intact nerves did produce a significant increase in protein concentration and an emetic response associated with increased mucus and acid production by the stomach, which dissipated during the stimulation period. Stimulation of the distal ends (efferent fibers) of the cut vagus nerves in dogs with intact gastric innervation significantly increased the volume and protein output of the pancreas and the acid output of the stomach. Stimulation of the distal ends of cut right and both vagus nerves in animals whose stomachs had been selectively denervated significantly increased the volume and protein output of the pancreas without increasing the output of acid by the stomach. The data indicate that the canine pancreas is innervated directly by vagal fibers, which when stimulated produce an increase in the protein (enzyme) output and the volume of secretion. Maintenance of the pancreatic response following denervation of the stomach suggests that the response is primarily the result of direct vagal innervation and is not produced by gastrin released from the antrum.

3978 EFFECT OF HYPOBARIC HYPOXIA ON PANCREATIC SECRETION STIMULATED BY FOOD AND BY INTRADUODENAL INFUSION OF HYDROCHLORIC ACID. *(Pol.)*

Mroczka, J.; Sieppel-Maciejewska, K.; Bilski, R.; Konturek, S. (Acad. Med., Krakow, Poland). *Przegl. Lek.* 31(10):847-851, 1974.

Seven dogs with pancreatic fistulas were put into a baric chamber and pancreatic secretion stimulated in the first series of experiments by a mean meal (25 g/kg) and in the second series by intraduodenal infusion of 0.1 N hydrochloric acid (8 mEq/hr). The barometric pressure was decreased to approximately 1/2 atmosphere for 2 hr, and pancreatic juice was collected every 15 minutes. The volume and bicarbonate and protein outputs were determined and compared to controls. After the meat meal the volume of the pancreatic juice secreted during the first hr decreased 50% and during the second hr, 62% (22 and 13 ml, resp., as compared to 45 and 35 ml, resp. in controls). Bicarbonate output decreased 66% after 1 and 76% after 2 hr (1.95 and 1.05 mEq/hr, resp., as compared to 5.66 and 4.35 mEq/hr, resp. in controls). Protein contents decreased 30% after 2 hr (1315 mg and 895 mg resp. in the experimental group and 1343 mg and 1180 mg in controls). After the pressure returned to normal, the values of the measured parameters in the experimental group exceeded those in controls. When HCl was instilled into the duodenum the decreases were less pronounced than in the first series. The volume decreased 23%, bicarbonates 33%, and protein 33%. Lower values persisted in this series, even after pressure was increased to normal values. It is concluded that hypoxia connected with lowering of atmospheric pressure causes a marked inhibition of pancreatic secretion.

3979 ACTION OF SOME SYMPATHOMIMETIC AMINES UPON THE EXTERNAL SECRETION OF THE PANCREAS IN THE RAT. *(Fr.)*

Roze, C.; Debray, C.; de La Tour, J.; Souchard, M.; Vaille, C. (Bichat Hosp., Paris, France). *J. Pharmacol. (Paris)* 5(2):155-172, 1974.

Male CF Wistar rats under urethane anesthesia with acute pancreatic fistula were studied for the effects of various substances on pancreatic secretion. Epinephrine and norepinephrine increased the output of pancreatic juice by a factor of 2.5 after 10 min of i.v. perfusion at concentrations of 0.13 μM/kg/min and 0.232 μM/kg/min, resp. Isoproterenol had the same effect, but it was more marked and occurred at lower concentrations. At a concentration of 0.05 μM/kg/min, pancreatic secretion rose to about 75% of the maximal secretory capacity induced by secretin. The logarithmic relation of dose/effect approximated a linear function. Propranolol (2 mg/kg i.v.) produced a moderate and prolonged decrease in the basal pancreatic output, and delayed and decreased the effect of isoproterenol administered after the propranolol. Phenoxybenzamine alone (2 mg/kg) had a marked and very prolonged stimulating effect on pancreatic output. Association of phenoxybenzamine and propranolol did not block the effect of isoproterenol more than did propranolol alone. Sparteine, which inhibits the hyperglycemia produced by the urethane anesthesia, was administered with isoproterenol to determine whether the urethane affected the apparent effect of isoproterenol. It was found that the effect of isoproterenol remained the same. The pancreatic output of bicarbonates is increased by isoproterenol stimulation. Total proteins and amylase output is either unchanged or slightly increased by the sympathomimetic amines, doubtless due to a washing out effect. Propranolol has a prolonged decreasing effect, and phenoxybenzamine has a prolonged increasing effect on the pancreatic output of proteins and amylase, which reflects variations in water output rather than in concentration of protein and amylase. The results suggest an α-adrenergic inhibitor and β-stimulant effect, which diverges from the classical picture of uniquely inhibitor sympathetic effects demonstrated in the dog, cat, and guinea pig. This evidence also diverges from the picture of stimulation of receptors associated with an increase in intracellular AMP_c concentration demonstrated *in vitro* for the rat, rabbit, cat, and mouse. It may be that in the anesthetized rat, AMP_c plays a role in hydrolytic secretion.

3980 METHADONE INHIBITION OF CENTRAL VAGAL PANCREATIC STIMULATION INDUCED BY 2-DEOXY-D-GLUCOSE. DESENSITIZATION BY REPEATED ADMINISTRATION. *(Fr.)*

Vaille, C.; Roze, C.; de La Tour, J.; Souchard, M.; Debray, C. (Bichat Hosp., Paris, France). *C. R. Acad. Sci.* [*D*] *(Paris)* 279(20):1641-1644, 1974.

A study was undertaken in Wistar CF rats to determine whether chronic administration of methadone had any effect on methadone-induced suppression of pancreatic stimulation produced by 2-deoxy-D-glucose (2DG). Rats were given methadone hydrochloride (5 mg/kg/day s.c., gradually increased to 7.5, 10, 12.5, and 15 mg/kg/day) over a 2 or 4 week period. After methadone treatment, rats were anesthetized with urethane and double biliary and pancreatic fistulas were established. After measurement of basal pancreatic secretion, 5 mg/kg methadone hydrochloride was injected s.c., followed, 5 min later, by 75 mg/kg i.v. of 2DG. Pancreatic secretion in these rats was compared with that in rats given 2DG alone or methadone plus 2DG without methadone pretreatment. In rats not pretreated with methadone, injection of methadone followed by 2DG had no effect on the output of pancreatic juice or protein. In rats given methadone for 2 weeks, acute methadone injection suppressed and delayed the stimulation produced by 2DG. After 4 weeks of methadone pretreatment, acute methadone injection no longer blocked pancreatic stimulation induced by 2DG but increased it. Parallel changes occurred in total protein and amylase secretion. In rats pretreated with methadone, basal pancreatic secretion (both volume and total protein) was significantly increased after surgery, but returned to control values within a few hours. This increased basal secretion may be due either to catecholamine release induced by urethane anesthesia or by hyperfunction of vagal secretory neurons.

3981 EFFECT OF EXTRAGASTRIC AND TRUNCAL VAGOTOMY ON PANCREATIC SECRETION IN THE DOG. *(E.)* Debas, H. T.; Konturek, S. J.; Grossman, M. I. (VA Wadsworth Hosp. Cent., Los Angeles, Calif.). *Am. J. Physiol.* 228(4):1172-1177, 1975.

The effect of extragastric vagotomy on pancreatic secretion was examined in four mongrel dogs with chronic pancreatic and gastric fistulas and compared to the effect of subsequent transthoracic truncal vagotomy in the same animals. Dose-response studies of pancreatic bicarbonate and protein secretion were done with i.v. infusions of secretin, octapeptide of cholecystokinin, and 2-deoxyglucose. The pancreatic response to a meal of beef liver (15 g/kg) and intraduodenal perfusion of graded concentrations of HCl, sodium oleate, and tryptophan were also studied. Each stimulant was studied on two occasions in each of three stages: control; after extragastric vagotomy; and after transthoracic truncal vagotomy. During each test, the gastric fistula was kept open. Pancreatic juice was collected continuously and separated into 15-min samples. The responses to secretin, octapeptide of cholecystokinin, and to duodenal HCl perfusion were either unaltered or only slightly decreased by either extragastric or truncal vagotomy. Basal pancreatic secretion and the responses to duodenal perfusion of oleate and tryptophan were markedly depressed by extragastric vagotomy. Extragastric vagotomy also reduced pancreatic responses to a meal and to 2-deoxyglucose. Subsequent truncal vagotomy caused still further reduction, possible by depressing antral gastrin release. These findings indicate that tonic vagal activity contributes to basal pancreatic secretion but has little effect on the response of the pancreas to secretin or cholecystokinin, or on the release of secretin from the intestine. It is suggested that the decreased pancreatic response to intestinally perfused oleate and tryptophan seen after extragastric vagotomy could be caused either by interruption of reflex paths between gut and pancreas or by interference with cholecystokinin. It is concluded that any advantage that selective vagotomy may have over truncal vagotomy in the treatment of duodenal ulcer probably cannot be attributed solely to an effect on the pancreas.

3982 SECRETORY AND METABOLIC EFFECTS OF ALCOHOL ON THE PANCREAS. *(E.)* Webster, III, P. D. (VA Hosp., Augusta, Ga.). *Ann. NY Acad. Sci.* 252: 183-186, 1975.

3983 EFFECT OF ANTIBIOTICS ON EXOCRINE PANCREATIC FUNCTION. *(Ger.)* Fleischer, K. (Med. Clin., Univ. Wurzburg, Germany). *Ber. Phys. Med. Ges. Wurzburg* 82:45-51, 1974.

3984 STUDY OF EXOCRINE SECRETION FROM DUODENO-PANCREATIC HOMOTRANSPLANTS IN THE DOG. *(Fr.)* Gautier-Benoit, C.; Pinchon-Marsy, S.; Pinchon, J.; Chambon, J.; Daboust, M.; Wattine, M.; Hardy, E.; Duwat, R. (Hosp. Cent., Lens, France). *Lille Chir.* 29(3):77-79, 1974.

3985 RELATIONS BETWEEN PANCREATIC AND BILE SECRETION: EXPERIMENTS ON DOGS. *(Ger.)* Nowak, W.; Sill, U.; Lippert, H.; Reding, R. (Surg. Clin., Ernst Moritz Arndt Univ., Greifswald, Germany). *Zentralbl. Chir.* 99(41):1288-1291, 1974.

3986 INTRADUODENAL CALCIUM STIMULATES THE LIBERATION OF CHOLECYSTOKININ-PANCREOZYMIN (CCK-PZ) IN MAN. *(Ger.)* Holtermuller, K. H.; McCall, J. T.; Malagelada, J. R.; Go, V. W. L. (Med. Clin., Univ. Mainz, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:536-537, 1974.

3987 INFLUENCE OF DIMINISHED MOTOR ACTIVITY ON THE ENZYME EXCRETORY FUNCTION OF THE PANCREAS AND THE EXTERNAL SECRETORY FUNCTION OF THE LIVER OF RATS. *(Rus.)* Smirnov, K. V.; Goland, L. G.; Medkova, I. L. (no affil.). *Kosm. Biol. Aviakosm. Med.* 8(3):22-26, 1974.

3988 CHANGES IN SERUM GASTRIN LEVELS AFTER INTRADUODENAL ADMINISTRATION OF BILE. *(Ger.)* Londong, W.; Fruhauf, S.; Forell, M. M. (2nd Med. Clin., Univ. Munich, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:516-518, 1974.

3989 PERIODIC CHANGES IN PANCREATIC ENZYME SECRETION DURING FASTING. *(Rus.)* Shligin, G. K.; Laktaeva, T. V. (Inst. Nutr., Moscow, USSR). *Fiziol. Zh. SSSR* 61(4):628-635, 1975.

3990 THE MECHANISM OF ACTION OF PARENTERALLY ADMINISTERED PROTEIN HYDROLYSATES ON EXOCRINE PANCREAS. *(Rus.)* Sisoiev, Iu. A.; Shlygin, G. K. (Inst. Nutr., Moscow, USSR). *Fiziol. Zh. SSSR* 61(3):423-427, 1975.

3991 THE EFFECT OF ANTIBACTERIAL PREPARATIONS ON THE ACTIVITIES OF PROTEINASES IN PANCREATIC JUICE AND ON THE CONTENT OF SOME ENZYMES IN GASTROINTESTINAL ORGANS. *(Rus.)* Storozhuk, P. G.; Plakhotiniukova, V. V.: Tsynkalovskii, I. B. (Kuban Med. Inst., Krasnodar, USSR). *Vopr. Med. Khim.* 20(4):343-349, 1974.

3992 ACTIVITIES OF ELASTASE AND PROELASTASE IN RAT PANCREAS IN EXPERIMENTAL PANCREATITIS. *(Rus.)* Stefanov, A. V.; Levitskii, A. P. (Res. Inst. Stomatol., Odessa, USSR). *Vopr. Med. Khim.* 20(6): 634-637, 1974.

3993 DNA REPAIR SYNTHESIS FOLLOWING EXPOSURE OF GUINEA-PIG PANCREATIC SLICES TO METHYL-N-NITROSOURETHANE IN VITRO. *(E.)* Hasumi, K.; Iqbal, Z. M.; Alarif, A.; Epstein, S. S. (Case West. Reserve Univ. Sch. Med., Cleveland, Ohio). *Experientia* 31(4) 467, 1975.

See also, 3882, 3952, 4177.

SECRETION AND METABOLISM

Hepatobiliary Tract

3994 EFFECT OF PHENOBARBITAL, SPIRONOLACTONE AND PREGNENOLONE-16α-CARBONITRILE ON BILE FORMATION IN THE RAT. *(E.)* Von Bergmann, K.; Schwarz, H. P.; Paumgartner, G. (Inst. Clin. Pharmacol., Univ. Bern, Switzerland). *Naunyn. Schmiedeberg's Arch. Pharmacol.* 287(1):33-45, 1975.

The effects of phenobarbital, spironolactone, and pregnenolone-16 α-carbonitrile on bile flow and bile lipid secretion were studied in adult male Sprague-Dawley rats. Phenobarbital sodium (8 mg/100 g, once daily), spironolactone (10 mg/100 g, twice daily), pregnenolone-16α-carbonitrile (3.5 mg/100 g, twice daily), saline, or gum arabic in water were administered by stomach tube for 4 days. Twenty-four hr after the last infusion, the bile duct was cannulated and the bile collected over three 10-min periods. In a second study, rats pretreated as above were infused with sodium taurocholate and the effect on the bile determined as above. Phenobarbital, spironolactone, and pregnenolone-16α-carbonitrile increased bile flow but did not alter bile salt excretion. During bile salt infusion, phenobarbital decreased the secretion of cholesterol and phospholipid to 39% and 49% of control values, resp.; however, spironolactone and pregnenolone-16α-carbonitrile more than doubled cholesterol excretion without influencing the output of phospholipid. As a result, phenobarbitol decreased the degree of cholesterol saturation while spironolactone and pregnenolone-16α-carbonitrile increased it. The findings indicate that different types of enzyme inducers may differ in their effects on biliary lipid secretion. Thus, depending on its influence on the cholesterol saturation of the bile, an inducer could contribute to or prevent the formation of cholesterol gallstones.

3995 HORMONAL CONTROL OF THE POTASSIUM LEVEL IN ISOLATED RAT LIVER CELLS. *(E.)* Barnabei, O.; Leghissa, G.; Tomasi, V. (Lab. Comp. Physiol., Univ. Bologna, Italy). *Biochim. Biophys. Acta* 362 (2):316-325, 1975.

Liver cells isolated from nonfasted female Wistar rats were incubated in media containing epinephrine, theophylline, insulin, ouabain, and/or glucagon, and the effects on potassium uptake and on the cyclic AMP levels of the cells were monitored. Liver cells isolated by the method of Berry and Friend (1969) contained about 48 μEq K+/g. Although 44% of the potassium was lost when the cells were kept at 4 C for 5 hr, the initial ion levels were restored by incubation at 37 C. Ouabin, epinephrine, and epinephrine plus theophylline inhibited the uptake of potassium by these cells; insulin partially counteracted the inhibiting effect of epinephrine, but had no effect on the basal potassium levels. Liver cells isolated by the procedure of Seglen (1972) were able to synthesize glycogen from glycose and contained a much higher level of potassium (102.2 μEq/g). Again, epinephrine and theophylline inhibited the uptake of K+, as did monobutyryl cyclic AMP and ouabain. Epinephrine and theophylline, alone and in combination, also increased the cellular levels of cyclic AMP; both epinephrine and glucagon produced, respectively, a 2- and 4-fold increase in cyclic AMP after only 2 min of incubation at 37 C. Ouabain and insulin had no effects on the cyclic AMP levels. The results suggest that the epinephrine-stimulated efflux of K+ in isolated liver cells may be due to an inhibition of the activity transport of potassium; this effect is probably mediated by cyclic AMP.

3996 EFFECT OF DIPHENYLHYDANTOIN ON THE HEPATIC MICROSOMAL ETHANOL OXIDIZING SYSTEM IN THE RAT. *(E.)* Andreasen, P. B.; Bremmelgaard, A. (Rigshosp., Copenhagen, Denmark). *Pharmacology* 12(4-5): 237-243, 1974.

The effect of diphenylhydantoin (DPH) on the hepatic microsomal ethanol-oxidizing system was investigated in female Wistar rats. The animals received 5-10 or 33-37 daily i.p. injections of DPH (75 mg/kg) or isotonic saline, after which the liver was removed and the microsomal protein and cytochrome P-450 content and lactate dehydrogenase and ethanol-oxidizing activities were determined. In the rats treated with DPH for 5-10 days, the microsomal lactate dehydrogenase activity was significantly elevated over control values; all other parameters were within normal limits. In the rats treated for 33-37 days, the liver weight, lactate dehydrogenase activity, cytochrome

P-450 content, and microsomal ethanol-oxidizing activity were all significantly elevated over control values. The hepatic cytochrome P-450 content and microsomal ethanol-oxidizing activity were significantly correlated, as were the hepatic lactate dehydrogenase activity and the microsomal ethanol-oxidizing activity. The results suggest that the interaction between ethanol and DPH metabolism may be mediated *in vivo* at the microsomal level.

3997 OXIDATION OF ETHANOL BY HEPATIC MICROSOMES OF ACATALASEMIC MICE. *(E.)* Lieber, C. S.; DeCarli, L. M. (Bronx VA Hosp., N.Y.). *Biochem. Biophys. Res. Commun.* 60(4):1187-1192, 1974.

Acetaldehyde production was used to assess ethanol oxidation by the liver microsomes of acatalasemic mice. The hepatic microsomes of Cs^b acatalasemic and Cs^a control mice were incubated *in vitro* with ethanol (50 mM) and a NADPH-generating system, and the activity of the microsomal ethanol-oxidizing system (MEOS) was measured. When subjected to heat inactivation, the liver microsomes of the actalasemic mice displayed decreased catalytic activity, but the NADPH-dependent MEOS remained unaffected. Even without heat inactivation, the NADPH-dependent metabolism of ethanol was much more active than the H_2O_2-mediated system, while the microsomes of the control mice showed equal rates of H_2O_2- and NADPH-dependent ethanol oxidation. The addition of catalase to the Cs^b liver microsomes *in vitro* markedly increased the capacity of the microsomes to oxidize ethanol in the presence of an H_2O_2-generating system and abolished this difference between the 2 strains of mice. In the presence of the catalase inhibitor azide, control Cs^a microsomes behaved similarly to the microsomes of the Cs^b animals. The selective persistence in the Cs^b mice of NADPH-dependent ethanol oxidation contrasting with the reduction in the H_2O_2-mediated metabolism of ethanol supports the existence of a catalase-independent ethanol-oxidizing system.

3998 PLASMA AND HEPATIC BINDING OF INDOCYANINE GREEN IN GUINEA PIGS OF DIFFERENT AGES. *(E.)* Hwang, S. W. (Natl. Inst. Environ. Health Sci., Research Triangle Park, N.C.). *Am. J. Physiol.* 228 (3):718-724, 1975.

The binding of indocyanine green (ICG) to the plasma and bile proteins of guinea pigs of varying ages was studied as was the uptake and efflux of ICG from liver slices. Protein binding was studied by a gel-filtration method in which plasma or bile samples from guinea pigs ranging in age from 1 day to adult were eluted with ICG in Sephadex columns. An ultracentrifugation method was used to study ICG binding to liver tissue, and the uptake of ICG by and efflux of ICG from liver slices was studied by placing fresh liver slices in beakers containing Krebs-Ringer-phosphate medium. The ICG in the plasma was almost totally bound to the plasma protein and there was no significant difference in binding between newborn and adult animals. The binding of ICG to biliary protein was also similar in all age groups. However, particulate fractions of liver from adult guinea pigs showed a higher ICG binding capacity than those from newborn animals at all ICG concentrations measured. The uptake of ICG by liver slices involved mostly active processes. The slice-to-medium (S/M) ratio of ICG was lowest in the liver preparations from the newborn animals, but the S/M ratio for adult animals was lower than that for 10-day-old animals. Liver slices from adult guinea pigs showed the fastest ICG efflux rates, the slowest rates being observed with the slices from the newborn animals. The results suggest that the degree of ICG binding to plasma and biliary proteins is not significantly different in newborn and adult guinea pigs. The incomplete development of ICG uptake and release mechanisms in the liver of the newborns may at least partially account for the lower biliary excretory capacity for ICG in the neonate.

3999 PHOSPHOLIPIDS AS CINCHOCAIN ACTION SITE DURING INHIBITION OF LIPOPEROXIDATIVE REACTIONS IN RAT LIVER MICROSOMES. *(E.)* Mishin, V.; Tsyrlov, I.; Gromova, O.; Lyakhovich, V. (State Inst. Med. Novosibirsk, USSR). *Hoppe Seyler's Z. Physiol. Chem.* 355(5):626-632, 1974.

The mechanism and site of action involved in the dibucaine hydrochloride-induced inhibition of microsomal lipid peroxidation was studied. Liver microsomes from male Wistar rats were incubated with dibucaine hydrochloride and NADPH- and ascorbate-dependent lipid peroxidation; the peroxidation activity of cytochrome P-450, the activity of NADPH-cytochrome reductase, and the binding of cinchocain with cytochrome P-450 were measured. Dibucaine hydrochloride inhibited oxygen consumption during NADPH- and ascorbate-dependent lipid peroxidation, but did not affect the cytochrome P-450 catalyzed decomposition of linoleic acid hydroperoxide. Dibucaine hydrochloride also did not hinder the process of microsomal electron transport from NADPH to cytochrome P-450. Metyrapone, a classical type II substrate, competitively interferred with the binding of dibucaine hydrochloride to cytochrome P-450, and phosphatidylethanolamine markedly weakened the inhibiting effect of dibucaine hydrochloride on microsomal lipid peroxidation. In addition, dibucaine hydrochloride considerably raised liver microsome hydrophobicity, increasing the quantum yield of 8-aniline-1-naphthalene sulfonate fluorescence in the lipid phase. The results suggest that an increased phospholipid hydrophobicity and a resultant decreased accessibility of the phospholipids for peroxidative reactions is responsible for the dibucaine hydrochloride-induced inhibition of microsomal lipid peroxidation.

4000 ACUTE CHOLESTASIS INDUCED BY LITHOCHOLIC ACID IN THE RAT. A FREEZE-FRACTURE REPLICA AND THIN SECTION STUDY. *(E.)* Miyai, K.; Mayr, W. W.; Richardson, A. L. (Sch. Med., Univ. California San Diego, La Jolla). *Lab. Invest.* 32(4):527-535, 1975.

Ultrastructural changes in lithocholic acid-induced cholestasis were studied by freeze-fraction techniques in female Wistar rats with bile fistulas. Sodium lithocholate was continuously infused i.v. (0.1 or 0.2 μM/min/100 g) for up to 4 hr. The higher dose induced complete cholestasis within 2-3 hr; the lower dose reduced the biliary output to less than 10% of the preinfusion level by the 3rd hr. Ultrastructural changes, primarily localized to the bile canaliculi and the pericanalicular region, were seen 30 min after the onset of bile acid infusion. Dilation of the bile canaliculi, loss of canalicular microvilli, prominence of the pericanalicular ectoplasm, and a characteristic lamellar transformation of the canalicular membrane developed, which become more prominent and widespread with time. The freeze-fracture replica study revealed that the canalicular microvilli became transformed through widening and flattening into multilamellar foldings. Intramembranous granules of the canalicular membrane appeared to have become redistrubuted, being few or absent in the transformed regions. In addition, a sharply angulated, crystalline material was seen in occasional bile canaliculi. This material appeared as a negative image in thin sections, indicating its solubility in organic solvents which were used for dehydration. With the lower dose of lithocholic acid, subcellular changes were similar to, but less severe and widespread than, those induced by the high dose. It is suggested that the hepatic ultrastructural changes which accompany lithocholic acid-induced acute cholestasis are attributable to the accumulation of this compound in the bile canaliculus and its vicinity. Lithocholic acid presumably causes an asymmetric perturbation in the molecular organization of the canalicular membrane which results in ultrastructural alterations and failure of fluid transport. In addition, precipitates of lithocholic acid appear to form in the bile canaliculi and may contribute to cholestasis.

4001 AN ETIOLOGIC BASIS FOR FATTY LIVER AFTER JEJUNOILEAL BYPASS. *(E.)* Hollenbeck, J. I.; O'Leary, J. P.; Maher, J. W.; Woodward, E. R. (Coll. Med., Univ. Florida, Gainesville). *J. Surg. Res.* 18(2):83-89, 1975.

An investigation undertaken in an attempt to prevent liver failure and fatty metamorphosis after jejunoileal bypass in experimental animals is described. An obesity bypass procedure was performed on eight healthy mongrel dogs. The intestine was divided 24 in from the pylorus and anastomosed end-to-side to the terminal ileum 12 in from the ileocecal valve. The blind end of the bypassed intestine was closed and a liver wedge biopsy performed. At subsequent monthly intervals the animals were operated upon, wedge biopsies were obtained, and aerobic and anaerobic cultures of bacterial flora were taken 12 in from the proximal end of the excluded limb. Four of the dogs received doxycycline hyclate, 100 mg/day p.o., while the other four received no antibiotics. All of the dogs survived the original procedure and experienced diarrhea as a sequelae of the operation; the diarrhea subsided within 10 days of the operation. Bacteriologic studies of the cultures taken from the defunctionalized intestine revealed *Bacteroides fragilis, Bacteroides species,* or both in all of the animals in the control group while none of the animals treated with doxycycline hyclate grew *Bacteroides*. It is suggested that *Bacteroides* organisms within the bypassed segment produce a hepatotoxic endotoxin. It was proposed that after obesity bypass, *Bacteroides*-specific antibiotics given p.o. may prevent post-bypass liver failure.

4002 BIOCHEMISTRY OF PEROXYSOME IN LIVER CELLS. *(Ger.)* Sies, H. (Inst. Physiol. Chem. Phys. Biochem., Univ. Munich, Germany). *Angew. Chem.* 86(22):789-824, 1974.

Biochemical studies on hepatocellular peroxysome are reviewed. The principal enzyme of peroxysome is catalase which is able to metabolize hydrogen peroxide both catalytically and peroxydatically. Catalase in peroxysome is associated with hydrogen peroxide-supplying oxidases. An active intermediate catalase-Fe^{3+}-H_2O_2 (complex I) is responsible for the peroxysomal H_2O_2 metabolism. Organ photometric investigations of intact, hemoglobin-free perfused rat liver for the selective measurement of Complex I is suitable for the dynamic study of the H_2O_2 metabolism taking place in the nanomol range. The frequency (quotient of rate of H_2O_2 formation and catalase heme concentration) can be increased to about 100/min by intracellular stimulation of the H_2O_2 production by glycolate and urate, against less than 10/min as measured in steady state. The predominantly peroxidatic oxidation of hydrogen donors, such as methanol and ethanol, at low frequencies at the expense of catalatic oxidation is of significance for normal and pathological metabolism. The catalatic oxidation of ethanol and methanol is stimulated by intensified H_2O_2 formation. Disturbances in hepatic metabolism in alcoholic states may be influenced by the administration of pyrazole derivatives with simultaneous stimulation of the peroxidatic metabolism of alcohol.

4003 ENZYME PROFILES OF MAMMALIAN BILE. *(E.)* Holdsworth, G.; Coleman, R. (Dep. Biochem., Univ. Birmingham, England). *Biochim. Biophys. Acta* 389(1):47-50, 1975.

The relations of the specific activities of bile enzymes to those in the hepatocytic plasma membrane was investigated. Bile was obtained from ox, sheep, pig, and rat, and liver homogenates were also prepared from these animals. Bile samples were also obtained from human patients. The following enzymes were assayed in both the bile samples and their corresponding liver homogenates: 5'-nucleotidase, alkaline phosphodiesterase I, L-leucyl-β-napthylamidase, Mg^{++}-ATPase, acid phosphatase, aryl sulfatase, succinate dehydrogenase, aryl esterase, LDH, and alcohol dehydrogenase. There were significant amounts of alkaline phosphodiesterase I, and smaller amounts of L-leucyl-β-naphthylamidase, 5'-nucleotidase and alkaline phosphatase (the four plasma membrane-bound enzymes) in the bile of each species. The intracellular enzymes (acid phosphatase, succinate dehydrogenase, LDH, and alcohol dehydrogenase) were completely absent from the bile. Polypeptide profiles of the bile samples as determined by electrophoresis showed a small number of bands when compared with those of the corresponding liver homogenates. It is concluded that preferential release of plasma membrane protein components is a consistent feature of bile salt secretion.

4004 INDUCTION OF HEPATIC ALKALINE PHOSPHATASE BY A SUBSTANCE IN BILE.

(E.) Jerksy, J. (Dep. Surg., Univ. Witwatersrand, South Africa). *S. Afr. J. Surg.* 12(4):255-257, 1974.

The effects of bile infusion on the production of serum alkaline phosphatase was studied in normal baboons. Bile was aspirated from the gallbladders of normal baboons and fractionated into 5 fractions, and 50 ml of each fraction was infused into 4 additional baboons. Infusion of whole bile was followed by a sharp rise in the serum alkaline phosphatase levels. Similar increases were noted after the infusion of the low-molecular weight and water-soluble fraction, but not after infusion of the high-molecular weight and ethanol-chloroform-soluble fractions. The whole bile and all fractions except the low-molecular weight fraction contained alkaline phosphatase activity. That a fraction which caused a rise contained no alkaline phosphatase supported the conclusion that the effect on enzyme levels was due to a substance in bile. Since the filter used for bile fractionation retains molecules with a molecular weight greater than 10,000 and as the filtrate contained the active ingredient, its molecular weight must be less than 10,000. Similarly, the stimulating substance must be water soluble. In hepato-biliary diseases this agent, which is produced in the liver and excreted in the bile, may be diffused into the circulation. From there, it would reach the liver where it could induce increased alkaline phosphatase production by all liver cells, whether obstructed or not. Such a mechanism would explain why alkaline phosphatase is often elevated in conditions where the serum bilirubin is normal.

4005 THE ENZYMATIC FORMATION OF BILIRUBIN.

(E.) Schmid, R.; McDonagh, A. F. (Dep. Med., Univ. California, San Francisco). *Ann. NY Acad. Sci.* 244:533-552, 1975.

The enzymatic formation of bilirubin *in vitro* and *in vivo* is reviewed. The biological and chemical systems that convert heme to bile pigment *in vitro* are discussed and three biological systems are described: 1) a light-mitochondrial fraction from the dog placenta; 2) cultured chicken macrophages; and 3) a microsomal enzyme system, heme oxygenase, obtained from spleen, liver, bone marrow, and other tissues. Results of experiments in these systems suggest that the third is responsible for the catabolism of heme *in vivo* and plays a major role in the conversion of hemoglobulin to bilirubin. The following sequence of reactions is probably involved in the formation of bilirubin IX α *in vivo*: *meso*-hydroxylation of heme at the α-bridge; autoxidation of the resulting α-hydroxyheme to carbon monoxide and a biliverdin-iron complex; hydrolysis of the iron complex to biliverdin IXα ; and finally, enzymatic reduction of biliverdin IXα to bilirubin IXα by biliverdin reductase. The mechanism of the initial event, the critical step, is still incompletely understood. *In vitro* studies suggest that heme, bound to a protein, utilizes NADPH and the microsomal electron transport system to reduce oxygen and generate a reactive radical which attacks the heme at the α-bridge to form α-hydroxyheme. In this model, therefore, bound heme catalyzed its own hydroxylation with a binding protein serving as a substrate-specific enzyme. Chemical evidence suggests that the structure of this heme-binding protein is such that the heme is bound in a specific orientation within a crevice and with a strong ligand coordinated to the iron. It is uncertain whether the heme-binding protein, which is equated with the microsomal heme oxygenase discussed under *in vitro* biological systems, is a unique protein specific to the endoplasmic reticulum, or whether other membrane-bound proteins can function in the same capacity.

4006 A MICROPUNCTURE STUDY OF RENAL SALT AND WATER RETENTION IN CHRONIC BILE DUCT OBSTRUCTION.

(E.) Bank, N.; Aynedjian, H. S. (Montefiore Hosp. Med. Cent., Bronx, N.Y.). *J. Clin. Invest.* 55(5):994-1002, 1975.

The mechanism of sodium retention by the kidney of white male Sprague-Dawley rats with common bile duct ligation was studied with micropuncture techniques. Before surgery, an average of 93.2% of the ingested sodium was recovered in the urine over a 3-day observation period. Only 85.6% of the ingested sodium was recovered in the urine 10-14 days after bile duct ligation. This difference of 7.6% represents a positive sodium balance of approximately 142 μEq/day. Measurements of renal blood flow and glomerular filtration rate yielded values that were not different from those in normal control animals. Single nephron filtration rate of surface nephrons was the same in the experimental rats as in the controls. Sodium reabsorption, however, was markedly increased in the proximal convoluted tubule, as well as in segments beyond the proximal convolutions. Single nephron filtration fraction, calculated from measurements of efferent arteriolar and arterial hematocrits, was significantly elevated in the cortical nephrons, even though whole kidney filtration fraction was the same as in normal rats. The calculated protein concentration of cortical peritubular blood was higher in the bile duct-ligated rats than in the normal controls. These observations are consistent with the view that sodium retention is the result of enhanced reabsorption primarily by cortical nephrons. It is suggested that the enhanced reabsorption can be accounted for by relative cortical ischemia due to efferent arteriolar vasoconstriction with the consequent elevation of peritubular colloid oncotic pressure.

4007 BIOSYNTHESIS OF UDP-GLUCOSE BY RAT LIVER MICROSOMES.

(Fr.) Berthillier, G.; Got, R. (Membr. Biochem. Lab., CNRS, Villeurbann, France). *Biochim. Biophys. Acta* 362(2):390-402, 1974.

A microsome fraction was obtained from Wistar rat livers by homogenization and centrifugation, and the supernatant was used to assay the concentration of soluble enzymes. Intermediary metabolites in the biosynthesis of uridine diphosphate glucose (UDP-glucose) were assayed by incubation of a suspension of microsomes in the presence of ^{14}C-glucose followed by analysis by column and thin layer chromatography; and by incubation of microsomes in the presence of glucose 1-phosphate, glucose-6-phosphate, or glucose followed by analysis of the concentration of synthesized UDP-glucose. After 15 min incubation of microsomes in the presence of ^{14}C-glucose, the quantities of glucose-6-phosphate, glucose-1-phosphate, and UDP-glucose formed were 0.96 m, 0.27 m, and 0.06 m, resp. For incubation of microsomes with any of the three precursors, equivalent quantities of UDP-glucose were formed. These results imply that phosphoglucomutase and UTP:D-glucose-1-phosphate uridyl transferase are present in the microsome membranes. The K_m of microsome membrane phosphoglucomutase was found to be 0.26 x 10^{-3} mM for glucose-1,6-diphosphate and 80 x 10^{-3} mM for glucose-1-phosphate at optimum pH and temperature. For soluble phosphoglucomutase, the respective K_m's were 0.4 and 40 x 10^{-3} mM. The K_m of microsome membrane UTP-D-glucose-1-phosphate uridyl transferase was found to be 220 x 10^{-3} mM for UTP and 166 x 10^{-3} mM for glucose-1-phosphate. For soluble UTP-D-glucose-1-phosphate uridyl transferase, the K_m's of UTP were 150 and 200 in and not in the presence of Triton X-100, resp., and for soluble UTP-D-glucose-1-phosphate uridyl transferase, the K_m of glucose-1-phosphate was 100 x 10^{-3} mM. It seems likely that there exists a double pathway, one soluble and one in the membrane, for UDP-glucose synthesis. The absence of accumulation of intermediary metabolites provides further evidence for an organized system of UDP-glucose synthesis by the membrane of rat liver microsomes.

4008 ROLE OF THE LIVER IN COAGULATION AND FIBRINOLYSIS: PATHOPHYSIOLOGICAL AND EXPERIMENTAL ASPECTS OF THE ISOLATED LIVER.

(Fr.) Losito, R. (Dep. Med., Univ. Sherbrooke, Canada). *Union Med. Can.* 103(12):2107-2110, 1974.

Isolated and perfused rat liver was used to study the role of vitamin K, oral anticoagulants, and fibrinolysis in hepatic hemostasis. ^{14}C-Menadione (vitamin K_3) was readily metabolized, and approximately 3/4 of the dose was excreted by both normal and hepatectomized rats. Normal and hepatectomized rats, resp., excreted only 10% and 0.5% of an injected dose of vitamin K_1. This shows that the liver is essential to the metabolism of vitamin K, but not of menadione. It also explains the superiority of vitamin K as an antidote for an overdose of oral anticoagulant. Experiments with ^{14}C-warfarin in the isolated and perfused liver show that it is also excreted more rapidly than vitamin K, although the warfarin activity in the plasma remains essentially intact. The radioactivity in the liver introduced by both warfarin and vitamin K is associated with the microsomes and the supernatant material. Experiments with the fibrinolysin streptokinase show that a certain quantity of plasmin was produced in the perfusate, and different antiplasmins could neither neutralize it nor eliminate it from the liver. Fibrinolytic activity existed in the bile during the entire time of perfusion with streptokinase.

4009 THE EFFECT OF BILE ACID SYNTHESIS ON CHOLESTEROL SECRETION INTO THE BILE.

(E.) Strasberg, S. M.; Ilson, R. G. (Toronto West. Hosp., Canada). *Ann. Surg.* 181(4):458-465, 1975.

Biliary cholesterol and bile acid secretion were studied in three female Rhesus monkeys during the period of increasing bile acid secretion and synthesis occurring 6-10 hr after interruption of the enterohepatic bile acid circulation by cannulation of the common bile duct. The bile acid pool was prelabeled by injection of ^{14}C-cholic acid 24 hr prior to start of the experiment. Bile acid synthesis and phospholipid secretion were increased 3- and 1.5-fold, resp., while cholesterol secretion was decreased 50-60% 40 hr after interruption of the hepatic circulation. Phenobarbital (5 mg/kg/24 hr i.v.) had no effect on the phospholipid secretion rate but did enhance cholesterol secretion and bile acid synthesis. These results suggest that bile acid synthesis influences cholesterol secretion into bile.

4010 ETHANOL - ANTIBIOTIC INTERACTIONS AT HEPATIC LEVEL.

(E.) Grassi, G. G.; Grassi, C. (Inst. Chemother., Univ. Pavia, Italy). *Int. J. Clin. Pharmacol.* 11(3):216-225, 1975.

The effects of acute and chronic ethanol intoxication on blood levels of several antibiotics were studied in fasted male Wistar rats. Acute ethanol intoxication (2 mg/kg 50% ethanol i.v. or 5 mg/kg p.o.) had no effect on blood levels of isoniazid, rifampicin, streptomycin, kanamycin or gentamycin. Although chronic intoxication (5 mg/kg 50% ethanol 5-30 days by gastric intubation) did not alter blood aminoglycoside levels, rifamypicin levels were decreased by 20-50% and isoniazid concentrations were increased 40-80%. Rifampicin impaired hepatic BSP elimination in both acute and chronic experiments with or without alcohol intoxication. Isoniazid affected BSP elimination only in chronically intoxicated and control animals. These studies indicate that ethanol can affect degradation of certain antibiotics and suggest that antibiotic dosage may need modification in alcoholic patients.

4011 ALTERATION BY PHENOBARBITAL AND 3-METHYLCHOLANTHRENE OF FUNCTIONAL AND STRUCTURAL CHANGES IN RAT LIVER DUE TO CARBON TETRACHLORIDE INHALATION.

(E.) Shah, H. C.; Carlson, G. P. (Coll. Pharm., Univ. Rhode Island, Kingston). *J. Pharmacol. Exp. Ther.* 193(1):281-292, 1975.

The effect of carbon tetrachloride (CCl_4) inhalation

(1100 ppm, 30 min) on hepatocyte polyribosome profiles, ^{14}C-leucine incorporation into liver protein and hepatocyte ultrastructure were studied in male Charles River rats pretreated with phenobarbital (50 mg/kg day for 4 days i.p.) or 3-methylcholanthrene (40 mg/kg/day for 2 days i.p.). The liver 9000 x g supernatant polyribosomal pattern was completely disrupted following CCl_4 inhalation in phenobarbital or 3-methyl-cholanthrene pretreated rats and returned to normal after 48 and 24 hr, resp. Incorporation of label into 9000 x g supernatant proteins was inhibited by 58%, 18% and 2% after 0, 24 and 48 hr in phenobarbital-treated rats and by 45% and 13% after 0 and 6 hr in three methycholanthrene-treated animals. The centrilobular hepatocytes of phenobarbital-pretreated rats exposed to CCl_4 showed dilation and vesiculation of cisternea of the rough endoplasmic reticulum as well as dilatation of the nuclear membrane space. Partial recovery occurred within 24 hr and complete recovery was seen 48 hr after exposure to CCl_4. No changes in the nuclear membrane or rough endoplasmic reticulum were observed in CCl_4 3-methylcholanthrene-treated animals. These results are explained by hypothesizing two activation sites for CCl_4 on the reduced NAD-cytochrome P-450 electron transport chain of the liver microsomes.

4012 VITAMIN B_6 METABOLISM IN CHRONIC ALCOHOL ABUSE. THE EFFECT OF ETHANOL OXIDATION ON HEPATIC PYRIDOXAL 5'-PHOSPHATE METABOLISM. *(E.)* Veitch, R. L.; Lumeng, L.; Li, T. K. (Indiana Univ. Sch. Med., Indianapolis). *J. Clin. Invest.* 55(5): 1026-1032, 1975.

The effect of chronic alcohol ingestion on hepatic vitamin B_6 metabolism was studied *in vivo* and *in vitro*. Male Sprague-Dawley rats fed a diet containing ethanol (36% of total calories) and pyridoxine (0.725 μg/ml) for 52 days had a significantly lower ($p < 0.02$) liver pyridoxal phosphate level (7.6 μg/200 mg protein) than animals fed a similar diet containing dextrin maltose instead of ethanol (8.5 μg/200 mg). Liver pyridoxal phosphate levels were also lower in rats fed an ethanol diet for 42 days without vitamin B_6 supplementation (3.0 μg/200 mg protein) than in controls devoid of B_6 supplementation (4.7 μg/200 mg). Perfusion of livers from B_6-sufficient rats with 18 mM ethanol for 3 hr lowered pyridoxal phosphate content by 3.8 μg/200 mg protein ($p<0.02$) compared to increase of 1.0 μg/200 mg in controls. Whereas release of preformed pyridoxal phosphate from perfused B_6-sufficient livers was linear for 3 hr, none was released from perfused B_6-deficient organs. Addition of pyridoxine to the perfusion medium of deficient livers resulted in a striking increase in both pyridoxal phosphate content and its release which could be partially inhibited by 18 mM ethanol. 4-Methylpyrazole (0.24 mM), a competitive inhibitor of liver alcohol dehydrogenase, almost completely abolished the effect of 18 mM ethanol on pyridoxal phosphate release and hepatic pyridoxal phosphate content of perfused organs. These results indicate that the effects of ethanol on hepatic vitamin B_6 metabolism in the rat depend upon its oxidation.

4013 BILE ACIDS. XLV. METABOLISM OF 3β,7α-DIHYDROXY-5α-CHOLESTANOIC ACID IN THE RAT WITH A BILE FISTULA. *(E.)* Mui, M. M.; Elliot, W. H. (St. Louis Univ. Sch. Med., Mo.). *Biochim. Biophys. Acta* 388(1):126-134, 1975.

The metabolism of ^3H-labeled 3β,7α-dihydroxy-5α-cholestanoic acid was studied in three adult male rats with cannulated bile ducts following i.p. administration of 0.34 mg of the potassium salt. Bile collected in the first 24 hr, containing 97% of the administered ^3H was hydrolyzed and the free bile acids were separated by acetic acid partition chromatography. Of the chromatographed tritium, 58% was associated with allochenodeoxycholic acid and 14% with its 3β-isomer; only 5% of the ^3H was found in alcocholic acid and 1% with its 3β-isomer. Less than 5% of the tritium appeared in fractions associated with the substrate or more polar unidentified materials. Thus, this dihydroxy-5α-cholestanoic acid is metabolized in the rat primarily to dihydroxy-5α-cholanic acids, comparable to the metabolism of 3α,7α-dihydroxy-5β-cholestanoic acid in man.

4014 IMMUNOLOGICAL PROPERTIES OF TWO FETUS-SPECIFIC GLOBULINS OF RAT IN EXPERIMENTALLY INDUCED HEPATIC LESIONS. *(E.)* Watanabe, A.; TAketa, K.; Kosaka, K. (Okayama Univ. Med. Sch., Japan). *Acta Med. Okayama* 28(5):321-322, 1974.

Two fetus-specific globulins have been detected in fetal rat serum by using specific antiserum prepared from immunized rabbits. The two globulins, α_1- and α_2-fetoglobulin, migrated on polyacylamide gel discs at rates relative to bromophenol blue of 0.58 and 0.55, resp. α_2-Fetoglobulin was PAS-positive. Both α_1- and α_2-fetoglobulins were detected in amniotic fluid and serum from cadmium chloride-treated rats by immunoelectrophoresis and double-diffusion analysis. Both globulins were detected in serum from adult rats bearing dimethylaminoazobenzene-induced hepatoma. α_2-Fetoglobulin was found in serum from CCl_4, thioacetamide and cadmium chloride-treated adult rats as well as partially hepatectomized animals and rats bearing ascites hepatoma. These results suggest that α_2-fetoglobulin is a sensitive index of tissue injury.

4015 STUDIES ON LIVER REGENERATION. DEOXYRIBONUCLEIC ACID SYNTHESIS IN THE ISOLATED PERFUSED LIVER AFTER IN VITRO AND IN VIVO PARTIAL HEPATECTOMY. *(E.)* Grandjean, C.; Garcia, H. (Univ. Nebraska Med. Cent., Omaha). *Lab. Invest.* 32(4): 552-554, 1975.

DNA synthesis was studied in isolated perfused male Wistar rat livers following *in vitro* partial hepatectomy. Perfused livers were allowed to incorporate ^3H-thymidine for 2 hr beginning 30 min after excision of the median lobe. Specific activity of DNA from perfused regenerating livers was increased 2.2-fold compared to nonregenerating perfused livers. The rate of increase in specific activity was similar to that for *in vivo* partially hepatectomized regenerating organs (2.6-fold). These results suggest that similar regulatory mechanisms for liver regeneration are operative both *in vitro* and *in vivo* and indicate that the liver *per se* may be the source and target of any initiating factor(s) responsible for the phenomenon.

4016 BIOSYNTHESIS OF BLOOD SERUM PROTEINS AND TRANSCRIPTION OF NUCLEAR RNA WITH REGENERATION OF RAT LIVER. *(Ukr.)* Polischuk, A. S.; Korotkoruchko, V. P.; Danko, I. M. (A. V. Palladin Inst. Biochem., Kiev, USSR). *Ukr. Biokhim. Zh.* 46(3):324-327, 1974.

4017 THE EFFECT OF THYROXINE ON ENZYME ACTIVITY IN MITOCHONDRIA OF REGENERATING RAT LIVER. *(Rus.)* Kaliman, P. A. (Kharkov Med. Inst., USSR). *Ukr. Biokhim. Zh.* 46(1):46-50, 1974.

4018 TIME CORRELATION BETWEEN DNA AND HISTONE SYNTHESIS IN REGENERATING RAT LIVER. *(Rus.)* Smirnova, V. N.; Rodinov, V. M. (Inst. Biol. Med. Chem., Moscow, USSR). *Biokhimiia* 39(6):1264-1269, 1974.

4019 EARLY AND LATE CHANGES IN NONHISTONE CHROMATIN PROTEINS ACCOMPANYING RAT LIVER REGENERATION. *(E.)* Yeoman, L. C.; Taylor, C. W.; Jordan, J. J.; Busch, H. (Baylor Coll. Med., Houston, Tex.). *Cancer Res.* 35(5):1249-1255, 1975.

4020 INDUCED CELL-CYCLE SYNCHRONY OF HEPATOCYTES AFTER PARTIAL HEPATECTOMY. *(E.)* Rabes, H. M.; Iseler, G.; Tuczek, H. V. (Inst. Pathol., Univ. Munich, Germany). *Naturwissenschaften* 62(3):142, 1975.

4021 ORNITHINE DECARBOXYLASE ACTIVITY IN REGENERATING LIVER FROM RATS ADAPTED TO CONTROLLED FEEDING SCHEDULES. *(E.)* Barbiroli, B.; Moruzzi, M. S.; Tadolini, B.; Monti, M. G. (Inst. Biol. Chem., Univ. Bologna, Italy). *J. Nutr.* 105(4):408-412, 1975.

4022 RATE OF RNA TURNOVER IN THE LIVER DURING HYPERCAPNIA IN ANIMALS. *(Ukr.)* Mykhailovsky, V. O.; Guly, M. F.; Sylonova, N. V.; Melnychuk, D. O. (O. V. Palladin Inst. Biochem., Acad. Sci. Ukr. SSR, Kiev, USSR). *Ukr. Biokhim. Zh.* 46(1):84-87, 1974.

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4144 STRESS-INDUCED BLOCKING OF THE MITOTIC CYCLE PROCESSES IN PROLIFERATING MURINE HEPATOCYTES. *(Rus.)* Uryvaeva, P. V.; Faktor, V. M. (Inst. Develop. Biol., Moscow, USSR). *Tsitologiia* 16(9):1100-1105, 1974.

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4147 THE INVESTIGATION OF THE PROTEIN CONTENT IN THE NUCLEI AND MITOCHONDRIA OF REGENERATING MOUSE LIVER. *(Rus.)* Revitch, G. G.; Mordukovitch, K. I.; Savina, M. I. (2nd Moscow Med. Inst., USSR). *Tsitologiia* 16(11):1382-1387, 1974.

4148 CHARACTERIZATION OF MICROSOMAL ELECTRON TRANSPORT COMPONENTS FROM CONTROL, PHENOBARBITAL, AND 3-METHYLCHOLANTHRENE TREATED MICE: I. DISTRIBUTION OF ELECTRON TRANSPORT COMPONENTS IN AMMONIUM-SULFATE FRACTIONS FROM MOUSE LIVER MICROSOMES. *(E.)* Mull, R. H.; Voigt, T.; Fleming, K. (Inst. Biophys. Radiobiol., Univ. Freiburg, Germany). *Biochem. Biophys. Res. Commun.* 64(3):1098-1106, 1975.

See also, 3787, 3789, 3802, 3882, 3985, 3986, 3987, 4180, 4539.

SECRETION AND METABOLISM

Intestine

4149 ENZYMES OF FRUCTOSE METABOLISM IN HUMAN SMALL INTESTINE MUCOSA. *(E.)* Heinz, F.; Schlegel, F.; Krause, P. H. (Med. Coll. Hannover, Germany). *Enzyme* 19(2):93-101, 1975.

The enzyme activities involved in fructose metabolism were measured in human intestine mucosa obtained 2 hr post mortem. Mucosa of the following gut sections were used: duodenum, jejunum, jejunum in the region of the flexura duodenojejunalis, distal jejunum, ileum middle region and ileum in the region of the valvula ileo cecalis. Only samples which showed a normal histological picture, where autolyzed cells were absent and no pathological changes could be observed, were chosen. Ketohexokinase, aldolase, alcohol dehydrogenases NAD- and NADP-dependent were found in all gut sections. The activity of aldehyde dehydrogenase was low in all sections tested. Triokinase could be found only in the duodenum and jejunum region and was absent in the ileum. Glycerate kinase was not present in the human intestine mucosa. Thus, the activities of all the enzymes involved in fructose metabolism were found in human small intestine mucosa, except D-glycerate kinase. There was, however, a broad standard deviation among the results, which may be due to differences in the nutritional state of the donors.

4150 EFFECT OF FAT FEEDING ON COMPLEX LIPID SYNTHESIS IN HAMSTER INTESTINE. *(E.)* Mansbach, II, C. M. (VA Hosp., Durham, N.C.). *Gastroenterology* 68(4):708-714, 1975.

Three enzymes engaged in complex lipid synthesis, diglyceride acyltransferase, cholinephosphotransferase, and lysolecithin acyltransferase, were studied in nonfasting hamster intestinal mucosa to determine if these enzymes were responsive to dietary fat supplementation. Male golden Syrian hamsters eating a fat-supplemented (corn oil) diet were compared to those eating a low fat (chow) diet. The diets were offered *ad libitum* for 1 week prior to death. The chow-fed group had gained an average of 4 g body weight and the fat-supplemented group, 5 g. The intestine was divided into four segments, pylorus to cecum, and the mucosa of each segment was scraped to yield a villous tip and crypt preparation. In the villous tips, fat supplementation had no effect on diglyceride acyltransferase and lysolecithin acyltransferase specific activity in the most proximal intestine. Both enzymes demonstrated increased activity in villous tips in response to fat feeding in the distal 3/4 of the gut. Cholinephosphotransferase activity was increased by fat feeding throughout the intestine in villous tips. Diglyceride acyltransferase and lysolecithin acyltransferase activity was greater in villous tips as compared to crypts. Cholinephosphotransferase activity was the same in crypts as in villous tips. Lysolecithin transferase was more responsive to fat feeding than was cholinephosphotransferase. It is claimed that these data lend support to the thesis that the lysolecithin acyltransferase pathway provides the lecithin associated with intestinal lipoprotein formation. Of four microsomal enzymes not related to lipid metabolism, only one, NADPH-cytochrome c reductase, was affected by fat feeding suggesting that the microsomal enzyme response to fat feeding was relatively specific.

4151 THE EFFECT OF ACUTE ETHANOL TREATMENT ON LIPID-REESTERIFYING ENZYMES OF THE RAT SMALL BOWEL. *(E.)* Rodgers, J. B.; O'Brien, R. J. (Albany Med. Coll., N.Y.). *Am. J. Dig. Dis.* 20(4): 354-358, 1975.

The acute effects of intraduodenal administration of ethanol (5 g/kg) on intestinal activities of lipid-reesterifying and disaccharidase enzymes of the small bowel were studied in male Sprague-Dawley rats. Animals were infused intraduodenally with ethanol or isocaloric glucose for 5 hr at 2.4 ml/hr. Animals were fasted overnight, sacrificed, and the small intestine distal to the ligament of Treitz removed and divided into the jejunal and ileal segments. Mucosal samples of each segment were scraped, homogenized, and assayed for enzyme activity. Acyl-coenzyme A(CoA):monoglyceride acyltransferase, acyl-CoA synthetase (acid:CoA ligase), sucrase, and lactase assays were performed on jejunal samples; acyl-CoA synthetase assay was performed on ileal samples. Ethanol administration produced greater activities of the lipid-reesterifying enzymes in the jejunum than did glucose administration. Ileal specific activity of acyl-CoA synthetase was also increased in the ethanol group. No effect of ethanol on jejunal disaccharadase enzyme activities was seen. It is concluded that ethanol, given acutely, has a specific stimulating effect on intestinal enzymes involved in lipid absorption.

4152 ILEAL HCO_3 SECRETION: RELATIONSHIP TO Na AND Cl TRANSPORT AND EFFECT OF THEOPHYL-

LINE. *(E.)* Sheerin, H. E.; Field, M. (Harvard Med. Sch., Boston, Mass.). *Am. J. Physiol.* 228(4):1065-1074, 1975.

Interrelationships among Na, Cl, and HCO_3 transport processes were examined in short-circuited New Zealand white, male rabbit ileal mucosa. Na and Cl fluxes at different serosal HCO_3 concentrations were determined either in paired experiments on tissues from the same animal or in nonpaired but randomized experiments. As serosal HCO_3 concentration was increased from 10 to 50 mM (pH from 7.1 to 7.8), net Na absorption decreased from 4.6 to 0.3 $\mu Eq/hr/cm^2$, net Cl flux changed from absorption of 0.9 to secretion of 0.9 and a net HCO_3 secretion of 3.0 developed. A similar change in net Cl flux was also observed when serosal CO_2 was altered at constant HCO_3 concentration. In Cl-free SO_4-Ringer, serosal alkalinization produced net HCO_3 secretion which was not significantly less than that observed in Cl-containing Ringer. Theophylline caused secretory changes in net Na and Cl fluxes at both 10 and 50 mM serosal HCO_3 concentrations. Theophylline did not alter net HCO_3 flux in Cl-Ringer but increased net HCO_3 flux in SO_4-Ringer. Total direct current conductance was decreased by both serosal alkalinization and theophylline. Short-circuit current was consistently increased by theophylline but not by serosal alkalinization. These results indicate that ileal ion transport is regulated in part by serosal pH and/or HCO_3 concentration and that resulting changes in Cl and HCO_3 transport are coupled 1:1 with changes in Na transport. It is also concluded that HCO_3 secretion does not require the presence of Cl in the bathing medium.

4153 DIGESTION AND ABSORPTION OF THE CONSTITUENTS OF CONCENTRATED MILK PRODUCTS WITH SPECIAL REFERENCE TO THE EFFECT OF INCREASED QUANTITIES OF LACTOSE. *(Pol.)* Cieslakowa, D.; Palaszewska, M.; Ziemlanski, S. (Inst. Nutr. Food Prod., Warsaw, Poland). *Przegl. Lek.* 31(2):328-333, 1974.

A total of 420 male Wistar rats (6 and 10 weeks old) were fed diets containing various amounts of lactose (from 3 to 15%). The following parameters were studied: digestion of protein and fat; the rate at which protein, fat, and lactose passed into the duodenum; the absorption of these nutrients in small intestine; and concentrations of α-amino nitrogen, fat, and glucose in the portal and cardiac blood. With increasing amounts of dietary lactose the rate of gastric emptying decreased, especially during the first 30 minutes. Increasing dietary lactose from 3% to 12% had no effect on digestion and absorption of nitrogen compounds from the small intestine, but 15% lactose slightly decreased protein digestion and decreased digestion and absorption of fat. Increasing dietary lactose from 3% to 15% caused a corresponding increase in rate at which liberated glucose was digested and absorbed.

4154 ACUTE AND CHRONIC EFFECTS OF ETHANOL ON INTESTINAL LIPID METABOLISM. *(E.)* Baraona, E.; Pirola, R. C.; Lieber, C. S. (VA Hosp., Bronx, N. Y.). *Biochim. Biophys. Acta* 388(1):19-28, 1975.

The effects of both the addition *in vitro* of various ethanol concentrations and the previous *in vivo* administration of ethanol on the ability of intestinal slices to oxidize fatty acids and to synthesize triacylglycerols were assessed in CD male rats. The rats were pair-fed a synthetic liquids diet containing 18% of the total calories as protein, 35% as fat, 11% as carbohydrate, and 36% either as ethanol or additional carbohydrate (control diet) for 3-4 weeks. Animals were sacrificed and the small intestine, from the angle of Treitz to the ileo-cecal junction, was stripped from the mesentery. Segments of the intestine from the proximal 20 cm of jejunum and from the ileum (between 30 and 10 cm proximal to the cecum) either were sliced in rings for the metabolic studies *in vitro* or were used for the enzyme assays. The addition of ethanol to the incubation medium in concentrations likely to be achieved in the upper jejunum after moderate drinking inhibited both palmitate and acetate oxidation, CO_2 production and triacylglycerol synthesis, but enhanced the esterification of fatty acid with ethanol. The concentrations required for the inhibitory effect were much higher than those needed to saturate enzyme systems known to participate in ethanol oxidation. *In vivo* administration of ethanol-containing diets produced persistent changes of the intestinal slices with respect to fatty acid oxidation and triacylglycerol synthesis. Acute intragastric administration of ethanol (3 g/kg) 1 hr prior to sacrifice, inhibited both processes in slices obtained from the jejunum, but not in those derived from the ileum. Chronic ethalol feeding increased the ability for fatty acid oxidation and triacylglycerol synthesis both in the jejunum and in the ileum. This stimulatory effect was associated with significant enhancement of palmitoyl-coenzyme A synthetase activity, suggesting increased fatty acid activation. These findings suggest that the high concentrations of ethanol to which the small intestine is exposed during drinking inhibit fatty acid oxidation and esterification to triacylglycerols apparently as a consequence of a direct damaging effect of alcohol. It is further suggested that prolonged ethanol administration promotes functional and structural changes which result in an increased capacity for fatty acid oxidation and triacylglycerol synthesis.

4155 INFLUENCE OF SECRETIN AND PENTAGASTRIN ON THE CIRCADIAN RHYTHM OF CELL PROLIFERATION IN THE INTESTINAL MUCOSA IN RATS. *(E.)* Pansu, D.; Berard, A.; Dechelette, M. A.; Lambert, R. (INSERM, Edouard Herriot Hosp., Lyon, France). *Digestion* 11 (3/4):266-274, 1974.

The effects of pentagastrin and secretin on DNA synthesis in rat jejunal mucosa were studied. Wistar rats were fasted 24 hr and given 25 μg/100 g pentagastrin or 3.5 U/100 g secretin, and sacrificed after 0, 4, 8, 12, 16, 20, and 24 hr. Controls were given saline. For the pentagastrin 6 rats were paired with 6 controls; for secretin, 7 rats paired with 6 separate controls. For DNA labeling, rats were injected i. p. with 70 Ci/100 g $[^3H]$ thymidine 30 min before killing. Histoautoradiography was done on sections of intestine 10 cm distal to the ligament of Treitz. Labeling index was the percentage of labeled nuclei counted in the proliferative compartment (the first 30 cells in the crypt) and mitotic index was the percentage of nuclei in the mitotic state determined for 1800 cells/crypt. After pentagastrin injection, labeling index was 31.73 at time 0, rose to 46.7 at 12 hr, and stabilized at this level until 24 hr later. In contrast, controls had a labeling index of 31.73 at time 0 which rose to 45.0 at 12 hr and returned to 36.45 at 24 hr. Treated cells had significantly higher indices than controls at 20 and 24 hr. The increased number of labeled cells in comparison to controls was in the upper part of the crypt. The mitotic index after injection rose from 7.31 at time 0 to 10.26, 24 hr later, similar to the control values of 7.30 at time 0 and 10.36 after 24 hr. After secretin injection the nocturnal increase in labeling index disappeared, there being no significant difference between values at time 0 (33.25) and 24 hr (38.10). The mitotic index was 7.83 at time 0 and remained steady, thus becoming significantly lower than control values after 24 hr (10.52). The decreased number of labeled cells in comparison to the controls was in the lower part of the crypt. It is concluded that pentagastrin has a stimulating effect on the circadian rhythm of cell renewal, increasing the labeling index and increasing the proliferative zone, while secretin has an inhibitory effect, decreasing both labeling and mitotic indices.

4156 CIRCADIAN VARIATIONS IN THE REACTION OF THE EPITHELIAL CELLS OF THE INTESTINE AND CORNEA OF MICE IN RESPONSE TO THE ACTION OF COLCHICINE. *(Rus.)* Semenova, N. F. (Khabarovsk Med. Inst., USSR). *Biull. Eksp. Biol. Med.* 78(12):68-71, 1974.

4157 INTESTINAL DISACCHARIDES IN RATS TREATED WITH 5-FLUOROURACIL. *(Ger.)* Hartwich, G.; Domschke, W.; Matzkies, F.; Pesch, H. J.; Prestele, H. (Med. Clin., Univ. Erlangen-Nuremberg, Erlangen, Germany). *Klin. Wochenschr.* 52(19):930-938, 1974.

4158 CHOLINESTERASE AND MONOAMINOXIDASE ACTIVITY OF THE SMALL INTESTINAL MUCOSA DURING PROTRACTED ACTIVITY OF ITS RESORPTION MECHANISM. *(Ukr.)* Iaremko, E. O. (Lvov Med. Inst., USSR). *Fiziol. Zh.* 21(1):52-56, 1975.

4159 PHOSPHOPYRIDOXAL COMPLEXES WITH HISTAMINE AND HISTIDINE: (3) THE INFLUENCE OF PRESUMED COMPLEX ON ACTIVITY OF RAT INTESTINAL HISTAMINASE. *(E.)* Sasiak, K.; Kierska, D.; Boguslawski, M.; Maslinski, C. (Dep. Biog. Amines, Polish Acad. Sci., Lodz). *Agents Actions* 5(1):25-30, 1975.

4160 EXPERIMENTAL RESEARCH ON SURGICAL TREATMENT OF OBESITY: INFLUENCE OF JEJUNOILEAL BYPASS WITH LIPECTOMY AND OF LIPECTOMY ALONE ON SOME PARAMETERS OF GROWING ANIMALS. *(It.)* Petronio, R.; Nicoli, N.; Giovaninetti, G. D.; Delaini, E. T. (Clin. Gen. Surg, Surg. Ther., Univ. Padua, Italy). *Chir. Ital.* 26(3):185-194, 1974.

4161 REGIONAL VARIATION IN GLYCOLYTIC ENZYME ADAPTATION TO DIETARY SUGARS IN RAT SMALL INTESTINE. *(E.)* Espinoza, J.; Hritz, A.; Kaplan, R.; Clark, S. B.; Rosenweig, N. S. (St. Luke's Hosp. Cent., Columbia Univ., New York, N.Y.). *Am. J. Clin. Nutr.* 28(5): 453-458, 1975.

4162 THE EFFECTS OF MALTITOL ON RAT INTESTINAL DISACCHARIDASES. *(E.)* Yoshizawa, S.; Moriuchi, S.; Hosoya, N. (Fac. Med., Univ. Tokyo, Japan). *J. Nutr. Sci. Vitaminol.* 21(1):31-37, 1975.

4163 MOLECULAR ACTION OF VITAMIN D IN THE CHICK INTESTINE. *(E.)* Lawson, D. E. M.; Emtage, J. S. (Dunn Nutr. Lab., Univ. Cambridge, England). In: *Vitamins and Hormones. Advances in Research and Applications.* edited by Harris, R. S. (New York: Academic Press, 1974).

See also, 3792, 3801, 3802, 3840, 4177, 4185.

GENERAL

4164 EFFECTS OF 400 R WHOLE-BODY X-IRRADIATION ON 5-HYDROXYTRYPTAMINE CONTENT OF THE RAT GASTROINTESTINAL TRACT. *(E.)* Penttila, A.; Kormano, M.; Ahonen, A. (Dep. Forensic Med., Univ. Helsinki, Finland). *Strahlentherapie* 149(4):426-437, 1975.

The effects of a single 400 r whole-body dose of x-irradiation on the regional 5-hydroxytryptamine content of the gastrointestinal tract of adult and young male Sprague-Dawley rats were studied from 4 hr to 40 days after irradiation using comparative chemical and morphological methods. The 5-hydroxytryptamine content of tissue pieces was determined in µg/whole organ, and per wet weight of tissue as well as per tissue protein using spectrophotofluorometry. After a single dose of radiation the total 5-hydroxytryptamine content of the stomach and intestinal tract was significantly lower in the irradiated than in the control rats 4 hr and 1 and 2 days after irradiation. The total amine content of the gastrointestinal tract returned to normal 5 days after irradiation and remained constant thereafter. Some differences were found between the various regions. Some minor morphological changes were seen in enterochromaffin cells 1 and 2 days after irradiation but not later. The effects of irradiation of the gastrointestinal tissues were stronger in young rats, in which no complete recovery of 5-hydroxytryptamine occurred within 45 days. The results support the view that irradiation exerts a direct damaging effect on the gastrointestinal 5-hydroxytryptamine storage, which is associated with liberation of 5-hydroxytryptamine from amine-containing cells. It is concluded that the duration of the effect varies with age and intestinal segment concerned and that the maturation of the animals affords some protection against its effects.

4165 MICROCIRCULATION OF THE NORMAL AND INFLAMED CANINE PANCREAS. *(E.)* Schiller, W. R.; Anderson, M. C. (Med. Coll. Ohio, Toledo). *Ann. Surg.* 181(4):466-470, 1975.

The microcirculation of the pancreas of five normal dogs and the inflamed gland of experimental pancreatitis induced in another five dogs was studied using an intraarterial injection of Microfil, a silicon rubber compound with a particle size of 1-3 μ. Laparotomy was performed through a midline incision upon 10 anesthetized adult mongrel dogs. In the five control animals, Microfil was injected into the cranial pancreaticoduodenal artery. The pancreas and adjacent duodenum were immediately excised between clamps and stored in a refrigerator overnight to allow polymerization of the Microfil. In the other five, pancreatitis was induced by a transduodenal retrograde injection of 150,000 U trypsin in 15 ml saline into the major pancreatic duct. The animals were re-operated 24 hr later, Microfil injected according to the same procedure as for the 3 controls, and specimens obtained and processed. Specimens were examined with a dissecting microscope and photographed. Duodenal vasculature and lobular vessels of the pancreas were studied as were those supplying the duct. Interlobular vessels were well visualized in the normal pancreas and intralobular vessels formed a fine reticular pattern throughout the cleared lobules. A complex network of vessels was observed in the pancreatic duct, apparently derived from the interlobular vessels. Intraductal trypsin injection produced focal areas of pancreatitis associated with edema, poor vascular filling and spastic changes of the lobular vessels. Extravasation of Microfil, although not apparent on normal specimens, was prominent in inflamed specimens and suggested vascular weakness and disruption. Pancreatic lobules adjacent to inflammatory areas showed definite evidence of dilatation. The inflamed pancreatic ducts were markedly edematous, thickened, and showed incomplete vascular filling. When the duodenum adjacent to the pancreatitis was injected with Microfil, edema and vasoconstriction were especially prominent in the duodenal muscular layer. It is suggested that the compromise of parenchymal circulation in combination with enzyme extravasation into the gland parenchyma may contribute to increased severity of the pancreatic inflammation; a re-distribution of pancreatic blood flow occurred with hyperperfusion of minimally involved areas and stasis in the inflamed pancreas. The changes in the duodenal microcirculation suggest that the abnormal gastrointestinal motility associated with pancreatitis may result in part from an altered circulation in the duodenal muscularis.

4166 THE EFFECT OF ELECTRICAL STIMULATION OF THE CELIAC GANGLION ON PANCREATIC BLOOD FLOW. *(Fr.)* Varga, B.; Folly, G.; Papp, M. (Inst. Exp. Med., Budapest, Hungary). *Lyon Chir.* 70(3): 168-170, 1974.

Male dogs averaging 16 kg were subjected to electrical stimulation of the left celiac ganglion with 2 min bursts of rectangular electrical impulses (20 impulses/sec at 2.5, 5, and 10 V). The pancreatic blood flow was measured by heated thermocouples and recorded on a fluorograph, while the arterial pressure was measured in a femoral artery. The stimulus amplitude was varied in a random sequence, and the corresponding blood flow was recorded. Electrical stimulation raised the blood pressure and decreased the pancreatic blood flow in proportion to the amplitude of the stimulus. When the pancreatic blood flow was increased by injecting dehydrocholic acid (4 mg/Kg/min i.v.), it dropped even more significantly when an electrical impulse was applied. It is suggested that during acute pancreatitis the reflex contraction of pancreatic blood vessels aggravates the disease. When laparatomy is performed, the celiac ganglion should be amply infiltrated with a local anesthetic to prevent spastic contraction of the pancreatic vessels.

4167 BACTERIAL DEGRADATION OF β-MURICHOLIC ACID IN THE RAT. *(Fr.)* van Heijenoort, Y.; Sacquet, E.; Riottot, M. (Lab. Germfree Anim., CNRS, Gif-sur-Yvette, France). *Nutr. Metab.* 17(2):65-73, 1974.

Bacterial degradation of β-muricholic acid was studied by thin layer chromatographic analysis of the feces of two holoxenic male Fischer rats, aged 3 months, which had been injected in the stomach with an excess of β-muricholic-4-^{14}C acid (12.25 mg, containing 0.44 μCi). By the second day after injection, almost 95% of the radioactivity had been excreted and was distributed among various degradation products of β-muricholic acid, principally hyodeoxycholate. When the hyodeoxycholate zone of the chromatograms was eluted and rechromatographed, 91% of the radioactivity originally injected was found at the level of the control methyl hyodeoxycholate. The remaining radioactivity was distributed at the levels of two unknown substances, four methyl esters of acids, particularly 3α, 6β-dihydroxy-5β-methyl cholanoate, and the chromic oxidation product of methyl β-muricholate. *In vitro* incubation of 5 mg β-muricholic acid-4-^{14}C with a homogenate of rat cecum resulted in degradation of only 22% of the β-muricholic acid. The radioactivity appeared on the chromatograms mainly at the level of an unknown substance and at the levels of two methyl cholanoates. There was no significant radioactivity at the levels of hyodeoxycholate and 3α, 6β-dihydroxy-5β-methyl cholanoate. These results contrast with observations on axenic rats in which β-muricholic acid is the main bile acid. The degradation pathway of β-muricholic acid by intestinal flora remains obscure.

4168 ARTERIOVENOUS INTESTINAL COMMUNICATIONS IN SHOCK. EXPERIMENTAL STUDY USING TAGGED MICROSPHERES. *(E.)* Androulakis, J.; Androulakis, G.; Vezeridis, M.; Kyriakou, K. (Aretaeion Hosp., Athens, Greece). *Int. Surg.* 60(4):206-208, 1975.

Polystyrene microspheres, 25 μ in diameter labeled with ^{141}Ce and ^{85}Sr were used to study the influence of oligemic shock on arteriovenous anastomoses of the small intestine mucosa of five dogs and five white New Zealand rabbits. One ml of [^{141}Ce] microsphere solution was injected into a catheter in the superior mesenteric artery. The intraaortic pressure was recorded through a catheter connected to an electromanometer. Oligemic shock was created by gradual peripheral arterial bleeding in 60-100 min, until blood pressure dropped to 20-30 mm Hg, and was maintained at this level for at least 30 min. At this stage, the ^{85}Sr solution was injected. Following injection of the second microsphere solution, the animal was sacrificed, using an i.v. dose of KCl. Radioactivity was measured in a specimen of small bowel corresponding to the injected branch of the superior mesenteric artery and one from the liver, as well as in the syringes before and after microsphere injection. No radioactivity was detected in the liver either before or during oligemic shock. Most of the radioactivity was retained in the intestinal mucosa. These data suggest that the microspheres did not pass through the microcirculation of the intestine, indicating that there are no arteriovenous anastomoses in the intestinal mucosa, or that if they do exist they are less than 25 μ in diameter. The last possibility is considered the more probable since there are many hemodynamic and metabolic indications for the existence of shunts and their opening during shock.

4169 THE NORMAL COLONIC BACTERIAL FLORA. *(E.)* Hill, M. J.; Drasar, B. S. (Colindale Hosp., London, England). *Gut* 16(4):318-323, 1975.

4170 THE MULTIPLICATION OF Trypanosoma equiperdum IN A DIFFUSION CHAMBER IMPLANTED IN MICE. *(Fr.)* Pautrizel, A. N.; Mattern, P.; Pautrizel, R. (Immunol. Parasit. Biol. Lab., Univ. Bordeaux II, France). *C. R. Acad. Sci. [D] (Paris)* 280 (15):1825-1828, 1975.

4171 RESEARCH ON THE DEVELOPMENT OF A MICRO-ORGANISM-FREE SMALL INTESTINE IN ADULT MICE. *(Ger.)* Meyer, E.; Stelzner, A.; Koch, H.; Kittlick, M. (Inst. Med. Microbiol., Friedrich Schiller Univ., Jena, Germany). *Wiss. Z. Friedrich Schiller Univ. Jena Math. Naturwiss. Reihe* 23(3/4):497-502, 1974.

4172 PLEOMORPHIC VIRUS-LIKE PATRICLES IN HUMAN FAECES. *(E.)* Mathan, M.; Swaminathan, S. P.; Mathan, V. I.; Yesudoss, S.; Baker, S. J. (Christian Med. Coll. Hosp., Vellore, India). *Lancet* 1(7915):1068-1069, 1975.

4173 FRACTIONATION OF RNA FROM THE LIVER, HEPATOMAS, AND GASTRIC MUCOSA BY PREPARATIVE POLYACRYLAMIDE GEL ELECTROPHORESIS. *(Rus.)* Kalinovskii, V. P.; Goriukhina, T. A.; Seits, I. F. (N. N. Petrov. Res. Inst. Oncol., Leningrad, USSR). *Vopr. Med. Khim.* 20(5):540-544, 1974.

4174 PRESENT STATUS OF THE d-UROBILINS. *(E.)* Petryka, Z. J.; Weimer, M.; Lightner, D. A.; Chedekel, M.; Bovey, F. A.; Moscowitz, A.; Watson, C. J. (Northwest. Hosp., Minneapolis, Minn.). *Ann. NY Acad. Sci.* 244:521-532,1975.

4175 THE NEURONAL POPULATION OF THE INTRAMURAL GANGLIA IN THE GASTROINTESTINAL TRACT. *(Rus.)* Krokhina, E. I.; Chuvilskaia, L. M. (Inst. Norm. Pathol. Physiol., Moscow, USSR). *Biull. Eksp. Biol. Med.* 79(3):110-113, 1975.

4176 THE INGESTION OF ASBESTOS FIBERS. *(E.)* Webster, I. (South African Med. Res. Counc., Johannesburg). *Environ. Health Perspect.* 9(12):199-202, 1974.

4177 THE EFFECT OF RETROANASTOMOSIS OF PANCREATIC CROSS-SECTION WITH SMALL INTESTINE ON HEALTHY PANCREATIC PARENCHYMA IN DOGS. *(Pol.)* Taczanowski, W. (Surg. Clin. II, Warzaw, Poland). *Pol. Przegl. Chir.* 46(12):1645-1650, 1974.

4178 DEMONSTRATION OF A CARCINOFETAL ANTIGEN ON THE MEMBRANE OF INTESTINAL CARCINOMA CELLS IN THE RAT. *(Fr.)* Martin, F.; Martin, M.; Knobel, S.; Bordes, M. (no affil.). *Ann. Immunol. (Paris)* 126 C(1):100, 1975.

4179 DIURNAL VARIATIONS IN RADIOSENSITIVITY OF MOUSE INTESTINE. *(E.)* Hendry, J. H. (Christie Hosp., Withington, England). *Br. J. Radiol.* 48(568):312-314, 1975.

4180 ASEPTIC ENDOTOXEMIA IN RADIATION INJURY AND GRAFT-VS-HOST DISEASE. *(E.)* Walker, R. I.; Ledney, G. D.; Galley, C. B. (Armed Forces Radiobiol. Res. Inst., Bethesda, Md.). *Radiat. Res.* 62(2):242-249, 1975.

4181 INTERACTIONS OF BILIRUBIN AND OTHER LIGANDS WITH LIGANDIN. *(E.)* Kamisaka, K.; Listowsky, I.; Gatmaitan, Z.; Arias, I. M. (Albert Einstein Coll. Med., Yeshiva Univ., Bronx, N.Y.). *Biochemistry* 14(10):2175-2180, 1975.

4182 A PROFILE OF THE RAT GASTROINTESTINAL TOXICITY OF DRUGS USED TO TREAT INFLAMMATORY DISEASES. *(E.)* Shriver, D. A.; White, C. B.; Sandor, A.; Rosenthale, M. E. (Wyeth Lab., Inc., Philadelphia, Pa.). *Toxicol. Appl. Pharmacol.* 32(1):73-83, 1975.

4183 ANIMAL MODEL FOR DETERMINING THE NO-EFFECT LEVEL OF ANTIMICROBIAL DRUG ON DRUG RESISTANCE IN THE LACTOSE-FERMENTING ENTERIC FLORA. *(E.)* Rollins, L. D.; Gaines, S. A.; Pocurull, D. W.; Mercer, H. D. (Food Drug Admin., Beltsville, Md.). *Antimicrob. Agents Chemother.* 7(5):661-665, 1975.

4184 EXPERIMENTAL CATHETER OBSTRUCTION OF THE GASTRIC CORONARY VEIN. POSSIBLE TECHNIQUE FOR PERCUTANEOUS INTRAVASCULAR TAMPONADE OF THE GASTROESOPHAGEAL VARICES. *(E.)* Rosch, J.; Goldman, M. L.; Dotter, C. T. (Univ. Oregon Med. Sch., Portland). *Invest. Radiol.* 10(3):206-211, 1975.

4185 THE EFFECT OF S-2-(3-AMINOPROPYLAMINO)ETHYLPHOSPHOROTHIOIC ACID (WR-2721) ON INTESTINAL CRYPT SURVIVAL. I. 4 MeV X-RAYS. *(E.)* Sigdestad, C. P.; Connor, A. M.; Scott, R. M. (Sch. Med., Univ. Louisville, Ky.). *Radiat. Res.* 62(2):267-276, 1975.

DIAGNOSTIC PROCEDURES

4186 PREOPERATIVE DIAGNOSIS OF THE MECKEL'S DIVERTICULUM BY SEQUENTIAL 99m TECHNETIUM PERTECHNETATE SCANNING. *(E.)* Lee, H. K.; Schwartz, I. S.; Nipper, T.; Gichon, G.; Beck, A. R. (City Hosp. Cent. Elmhurst, N.Y.). *Mt. Sinai J. Med NY* 42(2):136-141, 1975.

A 28-month-old female presented with a 2 hr history of passing bloody stools. There was no evidence of abdominal pain, nausea, or other symptoms, but there had been a 6 day episode of bloody stools at the age of 18 months. During the first 12 hr of observation no further bloody stools were passed. Twenty-four hr after admission an abdominal scan was performed. The stomach was emptied by nasogastric tube and 50 mg sodium iodide was injected i.v. to block background activity. The infant was placed supine under the scanning apparatus and 1.5 mCi of ^{99}m Tcpertechnetate was injected through a left leg vein. Sequential scintiphotos were taken for the following 4 3/4 hr. These demonstrated a round focal area of increased activity in the right mid-abdomen, simultaneously visualized with stomach activity. Meckel's diverticulum was diagnosed and confirmed on surgery. The diverticulum-bearing segment of ileum was resected, and the appendix removed. Histologic study showed normal ileal mucosa lining the segment, and numerous gastric parietal acid-secreting cells in the diverticulum that had caused extensive ulceration of the ileo-diverticular junction. Simultaneous scanning of the specimen showed a high concentration of technetium in the parietal cell portion. The appendix appeared normal. It is concluded that sequential scanning is useful in diagnosis of Meckel's diverticulum, and makes possible simultaneous visualization of the diverticulum and stomach activity.

4187 A NEW HYDROGEN ION TELEMETRY TECHNIQUE FOR EVALUATING GASTROESOPHAGEAL REFLUX. *(E.)* Brooks, J.; Kia, D.; Meguid, M.; Lewicki, A.; Membreno, A.; Culebras, J. (Peter Bent Brigham Hosp., Harvard Med. Sch., Boston, Mass.). *Surg. Gynecol. Obstet.* 140(5):749-955, 1975.

A new pH capsule telemetry technique was used to measure the pH fluxes in the upper part of the gastrointestinal tract in normal volunteers, symptomatic patients, and in those with hiatal herniorrgraphy during the preoperative and postoperative periods. The telemetry system consists of a pH-measuring radio capsule which measures the H^+ activity of the surrounding medium to ± 0.2 pH unit in a range of pH 1-8. The reference electrode is self-contained. The capsule is small (0.8 x 7.9 mm) and contains a radiotransmitter which emits a signal determined by the pH of the surrounding medium. This signal is converted to a linear graph on a strip chart recorder. The capsule was swallowed with ease and with minimal discomfort by a fasting patient. The mean basal pH range in the esophagus 5 cm above the gastroesophageal junction in fasting normal persons was 7.5. A significant drop occurred when the capsule entered the empty fasting stomach (3.8) and dropped further to 1.8 with the addition of 240 ml HCl. The mean basal esophageal pH in a group of patients with symptoms of reflux was 7.6. A significant, sharp and sudden pH drop to 2.6 occurred on advancing the capsule into the fasting stomach. On returning the capsule to a position 5 cm above the gastroesophageal junction, the pH stabilized to 7.0 which differed significantly from the basal esophageal pH in this group. In these patients, acid reflux into the lower part of the esophagus was consistently induced by this maneuver. In six patients with hiatal hernia, no reflux was noted after a transabdominal Nissen fundoplication or a Belsey-type buttress procedure. In two patients who underwent an Allison repair without fundioplication, reflux persisted postoperatively. It is concluded that this pH capsule telemetry is easy to perform on an ambulatory basis and allows an accurate and reproducible determination of the presence or absence of esophageal reflux in patients with and without hiatal hernia. Its correlation with symptomatic reflux is higher than that found with a conventional gastrointestinal series examination.

4188 OPERATIVE BIOPSY OF THE PANCREAS. *(E.)* George, P.; Brown, C.; Gilchrist, J. (R. Free. Hosp., London, England). *Br. J. Surg.* 62(4):280-283, 1975.

A retrospective study was undertaken of 47 patients (19-84 yr) who had open pancreatic biopsies during the course of a laparotomy to determine whether the procedure was safe and whether worthwhile information was obtained. The most common indication for biopsy (35 cases) was histological confirmation of a suspected carcinoma. Pancreatic biopsies were also taken from patients in whom the nature of the pancreatic pathology was in doubt and from patients who had preoperative investigations suggesting pancreatic disease but who had a macroscopically normal pancreas at operation. The anterior surface of the pancreas was exposed by opening the lesser sac. The biopsy was taken from the most superficial and firmest part of the lesion using a tenotomy knife; a small pyramid (0.3 x 0.3 x 0.3 cm) of tissue was removed. The exposed raw area was covered with either a piece of Oxycel or omentum, lightly held in place by two chromic catgut sutures. In this series of patients none of the postoperative complications could be attributed to the biopsy. It is claimed that the procedure is safe using the technique described provided that the biopsy is kept as superficial as possible and care is taken not to biopsy the region of the main pancreatic duct. It is concluded that the pancreatic biopsy is of value. If carcinoma is found, then there is unequivocal proof of the lesion. If chronic pancreatitis or a normal pancreas is found, then there is contributory evidence of a non-malignant condition. It is suggested that in the vast majority of cases (91% in this group) reliable information will be obtained.

4189 EMERGENCY PERITONEOSCOPY. *(Fr.)* Rachail, M.; Coralle, J.; Maurel, G. (Univ. Hosp. Cent. Grenoble, France). *Arch. Fr. Mal. App. Dig.* 63(2):103-108, 1974.

Emergency peritoneoscopies were performed on 80 patients: 14 with abdominal trauma (of the diaphragm, spleen, liver, pancreas, abdominal wall) or hemoperitoneum and 66 with acute abdominal diseases (cholecystitis, pancreatitis, choliangitis, appendicitis, intestinal obstruction, malignant tumors, tuberculosis, sigmoiditis). The procedure was well tolerated in all but 1 patient whose small intestine was punctured, and led to a correct diagnoses in 71 of 80 cases. It is recommended as a safe and efficient diagnostic procedure in cases of acute abdomen, even in comatose patients.

4190 THE TREHALOSE TOLERANCE TEST IN THE INVESTIGATION OF INTESTINAL ABSORPTION IN PATIENTS ON INTERMITTENT HEMODIALYSIS.

(Ger.) Pointner, H.; Flegel, U.; Bayer, P. M.; Schmidt, P. (1st Med. Clin., Univ. Vienna, Austria). *Wien. Klin. Wochenschr.* 86(22):691-693, 1974.

The trehalose test for intestinal malabsorption was performed on 9 uremic patients receiving intermittent hemodialysis. None had any signs of malabsorption. They were given 50 g α-D-trehalose one day before their weekly dialysis. One week later they received the same amount of glucose. The blood sugar content was checked at regular intervals from 0 to 120 minutes after each test, and a trehalose absorption index (TAI) was computed from these data. The same procedure was applied to a group of 5 normal patients. No significant difference in the TAI was found between the 2 groups. Thus the trehalose tolerance test is valuable in the diagnosis of malabsorption in patients with renal insufficiency.

4191 A SIMPLE METHOD FOR CALCULATING HEPATIC BILIRUBIN CLEARANCE: ITS APPLICATION IN PATIENTS WITH GILBERT'S SYNDROME.

(Ger.) Kutz, K.; Egger, G.; Bachofen, H.; Preisig, R. (Inst. Clin. Pharmacol., Univ. Bern, Switzerland). *Helv. Med. Acta* 37(5/6):386-387, 1974.

A simple method for the calculation of the hepatic bilirubin clearance in the diagnosis of Gilbert's syndrome is described. The bilirubin production in mg/day is calculated as the product of blood volume, hemoglobin concentration, daily rate of hemolysis, equalling 100/age of erythrocytes, and a factor 36.3. The age of the erythrocytes was determined by the ^{51}Cr method. This method, also requiring the determination of the serum bilirubin concentration, permits differentiation between patients with Gilbert's syndrome and normal subjects, as well as patients with increased hemolysis.

4192 IN VIVO STAINING OF GASTRIC MUCOSA: ITS APPLICATION TO ENDOSCOPIC DIAGNOSIS OF INTESTINAL METAPLASIA.

(E.) Ida, K.; Hashimoto, Y.; Kawai, K. (Murakami Mem. Hosp., Gifu, Japan). *Endoscopy* 7(1):18-24, 1975.

In vivo staining of the human gastric mucosa was examined using the indirect dye scattering method with p.o. methylene blue. Endoscopic examination following methylene blue administration revealed complete staining of the gastric mucosa within 2-3 min. Postgastrectomy examination of dye-stained specimens indicated that the dye was taken up by the surface epithelial layer of the gastric mucosa. The stained region was generally located in the pyloric gland area, and areas of intestinal metaplasia were selectively stained when present. Staining was observed in 105 (65.6%) of 160 patients, with staining frequency by disease as follows: gastric polyp, 93%; gastric ulcer, 55%; gastric ulcer scar, 77%; gastric carcinoma, 50%. These values increased with age. Ninety percent of the stained region was of the antral type, the antral region being primarily stained; the remaining 10% was of the intermediate type in which the staining ranged as far as the upper boundary of the pyloric gland area. The most common staining pattern (83%) was one in which granules were stained; in the remaining cases, small depressed regions between the granules were stained. The results suggest that granular-antral staining is the most commonly observed pattern. This *in vivo* staining method offers promise as a means of improving the endoscopic diagnosis of intestinal metaplasia, gastric cancer, and benign atypical epithelium.

4193 EVALUATION OF WHOLE AND PURIFIED HYDATID FLUID ANTIGENS IN THE DIAGNOSIS OF HUMAN HYDATIDOSIS BY THE IMMUNOELECTROPHORESIS TEST.

(E.) Varela-Diaz, V. M.; Guisantes, J. A.; Ricardes, M. I. Yarzabal, L. A.; Coltorti, E. A. (Pan Am. Zoonoses Cent., World Health Org., Ramos Mejia, Argentina). *Am. J. Trop. Med. Hyg.* 24(2):298-303, 1975.

The efficacy of whole sheep hydatid cyst fluid (WHF) and purified hydatid fluid antigen (PHF) in the diagnosis of human hydatid disease was evaluated with the immunoelectrophoresis (IEP) test. Both antigens were tested with preoperative and postoperative sera from 75 patients with hyatid disease, sera from 41 patients with other parasites, sera from 41 patients with nonparasitic diseases, and sera from 20 healthy donors. Among the hydatid sera, 86.7% yielded positive results with the PHF antigens, 70.7% yielded positive results with the WHF antigen, and 13.3% yielded negative results with both antigens. None of the non-hydatid sera reacted positively with the WHF antigen, but 28% of the sera from patients with other parasitic and non-parasitic diseases yielded positive results with the purified antigen. Among preoperative hydatid patients, the *Echinococcus granulosus*-specific arc 5 criterion of positivity was superior to the number of arcs in the diagnosis of hydatidosis with the WHF antigen. However, the number of bands other than arc 5 may be of value in the diagnosis of hydatid disease by the IEP test in cases where this diagnostic arc is absent.

4194 THE EARLY DIAGNOSIS OF BILIARY ATRESIA.

(E.) Kimura, S. (Iwate Med. Coll., Morioka, Japan). *Prog. Pediatr. Surg.* 6:91-112, 1974.

Thirty-four cases of biliary atresia and 12 cases of neonatal hepatitis were analyzed with regard to differential diagnosis. Seven cases of neonatal hepatitis and 22 patients with biliary atresia were admitted before the age of ten weeks. About 35% of the atresia cases while only about 25% of the hepatitis cases had jaundice present from birth. Marked progressive hepatomegaly was a characteristic of both groups, but a decrease in liver size before 3 months of age indicated hepatitis. Liver consistency was always harder in cases of atresia. Routine liver function tests were of little value. Serial determinations of total serum bilirubin levels showed increases in all but two of 10 cases of atresia, while hepatitis tended to show a fluctuating or gradually descending curve. High levels of alkaline phosphatase were found only in atresia during critical periods. Elevation of serum leucine aminopeptidase activity was more frequent in atresia than in hepatitis. The Rose Bengal test resulted in excretion of less than 6% ^{131}I in most of the atresia cases, and over 9% in most of the hepatitis cases during the 72 hr after i.v. administration. However, contamination of the feces with urine, despite precautions, reduced reliability. Serial scintigrams of the liver at 1, 24, 48 and 72 hr after injection of the ^{131}I proved to be more reliable. Shadows of the liver and kidneys could be clearly seen in atresia but not in hepatitis. Biopsy showed that portal fibrosis, ductular proliferation, and cholestasis in the ductular system and liver cells were more marked in biliary atresia. It is concluded that serial total bilirubin tests, leucine aminopeptidase activity tests, histologic examination of the liver, and most importantly the ^{131}I Rose Bengal excretion test with scintigraphy of the liver are most valuable in the differential diagnosis of these two conditions.

4195 EVALUATION OF BARIUM AND GASTROGRAFIN AS CONTRAST MEDIA FOR THE DIAGNOSIS OF ESOPHAGEAL RUPTURES OR PERFORATIONS.

(E.) Vessal, K.; Montali, R. J.; Larson, S. M.; Chaffee, V.; James, A. E., Jr. (Pahlavi Univ. Med. Sch., Shiraz, Iran). *Am. J. Roentgenol. Radium Ther. Nucl. Med.* 123(2):307-319, 1975.

The effects of barium sulfate and meglumine diatrizoate, alone and in combination with bacterial cultures of pooled human mouth flora, on the feline mediastinum were evaluated. Catheters were passed through the abdominal esophagus into the mediastinum of adult domestic short-haired cats. Commercial barium, sterile barium sulfate, meglumine diatrizoate, and/or flora were injected into the mediastinum *via* the catheters and the animals were monitored clinically and with chest roentgenograms for 2-90 days. All cats injected with the commercial barium had well-localized white, chalky deposits within the paraesophageal mediastinal tissue at the sites of inection, and some animals had similar foci scattered throughout the visceral and intercostal pleura. Granulomatous inflammation including vascular tissue and fibrosis was observed, the extent of such leions generally increasing with time; these lesions were free of bacterial, fungal, and protozoal organisms. Similar lesions were observed in the ats injected with sterile barium sulfate and in hose injected with barium plus flora. Most of he cats injected with meglumine diatrizoate alone showed no pathologic changes, although 1 had a minimal inflammatory reaction; most of the cats injected with meglumine diatrizoate plus flor had mild inflammatory reactions. Flora alone produced mildly to moderately acute mediastinal inflammation. In cultures of human flora, the commercial barium inhibited growth by 70%, while the sterile barium sulfate inhibited growth by 55%. The data suggest that the water-soluble contrast media cause no significant histologic reactions in the mediastinum. Although barium causes granuloma formation, its superior physical properties make it as the contrast agent of choice with difficult clinical problems relating to esophageal rupture or perforation.

4196 VALUE OF THE ENDOSCOPIC DYING METHOD WITH METHYLENBLUE.

(E.) Deyhle, P.; Tschen, H. (Dep. Inn. Med., Univ. Zurich, Switzerland). *Endoscopy* 7(1):24-26, 1975.

The specificity of the endoscopic methylene blue dye method described by Suzuki *et al.* was examined using 75 patients in whom diagnostic evidence had already been obtained. All of the carcinomas in these patients were homogeneously stained a deep blue, all stained areas yielding carcinomatous tissue on biopsy. The extent of the carcinoma was also more accurately defined after staining as compared with the results obtained with normal endoscopy. None of 12 benign ulcers took up the dye at their margins, and an adenomatous gastric polyp also failed to stain. Seventeen of 50 stomachs which appeared normal on normal endoscopy showed a stippled staining pattern with methylene blue which was readily distinguishable from the staining patterns of the carcinomas. Most of these areas showed intestinal metaplasia, although mucous-secreting cells were also stained. In 1 instance, an intestinal metaplasia failed to stain. In some cases, fragments of mucus adhering to the stomach wall took up the stain; in these instances, washing with water removed the dye. The results suggest that this dye method should be used where endoscopy points to suspected early cancer or to a carcinomatous ulcer, but where biopsy samples provide no confirmation. The method is, however, too time-consuming to find acceptance for routine endoscopy.

4197 DIFFERENTIATION OF PANCREATITIS FROM COMMON BILE DUCT OBSTRUCTION WITH HYPERAMYLASEMIA.

(E.) Lesser, P. B.; Warshaw, A. L. (Harvard Med. Sch., Boston, Mass.). *Gastroenterology* 68(4):636-641, 1975.

Patients with abdominal pain and hyperamylasemia (37) were evaluated to determine which elements of the history, physical examination, and laboratory tests are most useful in the differentiation of pancreatitis from common bile duct obstruction with hyperamylasemia. The patients studied had a surgical or definite radiological diagnosis of acute pancreatitis (13 patients), common duct stone without pancreatitis (9 patients), or common duct stone with acute pancreatitis (15 patients). The single facet of the history with discriminatory value was the location of the pain: patients with common duct stone had right upper quadrant pain more frequently than patients with common duct stone and acute pancreatitis or acute pancreatitis alone. Laboratory tests alone, serum amylase, urinary amylase, serum lipase, serum transaminase, bilirubin, and serum calcium were not reliable in the discrimination of pancreatitis from bile duct obstruction. The renal clearance of amylase, expressed as a percentage of creatinine clearance, clearly separated patients with acute pancreatitis and those with common duct stone and acute pancreatitis from patients with common duct stone without pancreatitis with no overlap of values. The mean amylase:creatinine clearance ratio for acute pancreatitis (9.8) and for common duct stone with acute pancreatitis (8.9) was significantly higher than for common duct stone without pancreatitis (3.2) and controls (3.1). In this study, an amylase:creatinine clearance ratio of greater than 5.5% indicated clinically important pancreatitis, and, conversely, a lower value indicated the absence of significant pancreatitis. It is suggested that this index would be useful in guiding the selection of patients for safe, early common duct exploration.

4198 GALACTOSE RETENTION: AN ALTERNATIVE TO THE BROMSULPHTHALEIN TEST.

(E.) Sinniah, D. (R. Victoria Hosp., Belfast, Northern Ireland). *Singapore Med. J.* 15(4):273-275, 1974.

A study of galactose retention was performed in 12 control subjects and 38 patients to determine if the galactose and BSP retention tests give equivalent information. The patient group included eight with obstructive jaundice, five with cancer metastases in the liver, eight with infectious hepatitis, and 17 with cirrhosis. The galactose test was carried out after an 8-12 hr fast. Galactose (350 mg/kg) was administered i.v. as a sterile 25% solution over a period not exceeding 3 min. When half the volume had been given, a stopwatch was started and 30 min later, 0.1 ml of blood was taken from a finger tip for galactose determination. In 15 of 17 cirrhotic patients, a 45 min BSP retention test was carried out immediately after the galactose test. The galactose retention was normal in 87.5% of patients with biliary obstruction and four single cases of mucocele of the gall bladder, the Budd-Chiari syndrome, duodenal ulceration, and polycythemia. The mean galactose retention in the group of patients with obstructive jaundice was 31.6 mg/100 ml; in the group with liver metastases, 84.0 mg/100 ml; in the hepatitis patients, 48.2 mg/100 ml; and in the cirrhotic patients, 88.8 mg/100 ml. There was good correlation between the results of the galactose and the BSP retention tests in the 15 cirrhotic patients. It is suggested that the galactose test has a place in the group of liver function tests because it can be used as an aid in differentiating between parenchymatous and obstructive jaundice and also as a substitute for the BSP test in the presence of jaundice, or where there is a history of allergy to BSP.

4199 PERCUTANEOUS ASPIRATION BIOPSY OF THE PANCREAS UNDER ULTRASONIC GUIDANCE.

(E.) Smith, E. H.; Bartrum, R. J., Jr.; Chang, Y. C.; D'Orsi, C. J.; Lokich, J.; Abbruzzese, A.; Dantono, J. (Harvard Med. Sch., Boston, Mass.). *N. Engl. J. Med.* 292(16):825-828, 1975.

Percutaneous aspiration biopsy of the pancreas under ultrasonic guidance was evaluated in 7 patients with suspected pancreatic tumors. In each case, the pancreatic mass was localized with a standard ultrasonic transducer. The standard transducer was then replaced with a modified instrument equipped with a central canal through which a 19-gauge needle was passed and directed along the path of the sound beam. A 23-gauge needle attached to an aspiration syringe was then directed through the 19-gauge needle and passed into the mass. In 5 cases, the aspirates provided cytologically conclusive evidence of carcinoma, and in a sixth patient the aspirate was strongly suggestive of neoplasia. None of the patients experienced subjective discomfort either during or after the percutaneous puncture procedure, and there was no objective clinical evidence of noteworthy patient injury. Although fine-needle biopsy is not expected to prolong life in patients with pancreatic tumors, it does eliminate the need for more complicated, uncomfortable, and hazardous diagnostic procedures. In many cases, exploratory surgery may be obviated. This method therefore appears to offer considerable value in overall patient management.

4200 RADIOISOTOPE SCINTIGRAPHY IN DIAGNOSIS OF BARRETT'S ESOPHAGUS.

(E.) Berquist, T. H.; Nolan, N. G.; Stephens, D. H.; Carlson, H. C. (Mayo Clin., Rochester, Minn.). *Am. J. Roentgenol. Radium Ther. Nucl. Med.* 123(2):401-411, 1975.

A new approach to the diagnosis of Barrett's esophagus is described. Patients suspected of having Barrett's esophagus were fasted and given 5 mCi Tc^{99m} pertechnetate i.v. Scintigraphic imaging was performed with the patient standing after 30 and 60 min. After the scan, the patients were given barium p.o. and a roentgenogram was taken in the upright position. In the normal person, the isotope is intensely concentrated by the stomach, there is a lack of radionuclide uptake by the esophagus, and evidence of activity is seen in the cardiac pool. In Barrett's esophagus, the roentgenogram shows an esophageal hiatal hernia and a stricture of the mid-esophagus. Activity is taken up by the stomach and esophagus to a level corresponding to that of the stricture. In 5 men with Barrett's esophagus, the diagnosis was made on the basis of an abnormal uptake of the isotope by the lower esophagus. In 1 additional patient who had a rare variant of Barrett's esophagus, Barrett's ulcer, the radioisotope was concentrated in the areas of esophageal ulceration. In each instance, the diagnosis was confirmed by tissue biopsy. Three patients with esophageal conditions other than Barrett's esophagus or Barrett's ulcer were also studied; scintigrams showed no esophageal uptake of pertechnetate and biopsies confirmed the absence of gastric mucosa in the esophagus. Scanning of the esophagus with Tc^{99m} pertechnetate appears to be useful in making or excluding a diagnosis of Barrett's esophagus and promises to be useful in studying the etiology of the disorder.

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See also, 4316, 4317, 4340, 4373, 4586, 4590, 4645, 4651, 4666, 4708, 4724, 4787, 4808, 4809, 4810, 4817, 4821, 4822, 4823, 4824, 4869, 4911, 4943, 5022, 5115, 5120.

GASTROINTESTINAL DISEASES

ESOPHAGUS

4299 EFFECT OF INCREASED INTRAABDOMINAL PRESSURE ON LOWER ESOPHAGEAL SPHINCTER PRESSURE. *(E.)* Dodds, W. J.; Hogan, W. J.; Miller, W. N.; Stef, J. J.; Arndorfer, R. C.; Lydon, S. B. (Med. Coll. Wisconsin, Milwaukee). *Am. J. Dig. Dis.* 20(4):298-308. 1975.

Lower esophageal sphincter (LES) responses to increased intra-abdominal pressure were evaluated in 20 normal subjects (mean age 22.6 yr) and 35 patients (mean age 47.3 yr) with reflux esophagitis. Intra-abdominal and intragastric pressure were increased by abdominal compression, the Valsalva maneuver, and leg raising. Changes in LES pressure were measured by station and rapid pull-through techniques, using a catheter system capable of radially recording pressure. Abdominal compression and Valsalva increased LES pressure in normal subjects, but the increase was about equal to the gastric pressure increase. Therefore, the LES-gastric pressure gradient remained unchanged. During leg raising, the LES pressure increased more than gastric pressure, thereby increasing the LES-gastric pressure gradient. Although statistically significant, the LES pressure increase (to 32.7 mm Hg) induced by leg raising was modest, unrelated to initial sphincter pressure, and unaffected by atropine. Excluding six individuals demonstrating a "common cavity" phenomenon, LES pressure changes during abdominal compression were similar in patients with esophagitis and controls. Consequently, LES response to abdominal compression does not separate most patients with esophagitis from normal subjects. The observed LES responses to increased intra-abdominal pressure are analyzed in terms of two mechanisms: extrinsic mechanical factors and a physiologic adaptive response of intrinsic LES tone. It is concluded that the findings are best accounted for by extrinsic mechanical factors.

4300 OROPHARYNGEAL DYSPHAGIA: MANOMETRIC AND CINE ESOPHAGRAPHIC FINDINGS. *(E.)* Hurwitz, A. L.; Nelson, J. A.; Haddad, J. K. (Fort Miley VA Hosp., San Francisco, Calif.). *Am. J. Dig. Dis.* 20(4):313-324, 1975.

The manometric and radiographic findings in a group of patients with oropharyngeal dysphagia were systematically studied and correlated. Manometric studies and cine-esophagrams were performed on 14 patients with symptoms of orophayrngeal dysphagia and 15 controls with a variety of other esophageal symptoms, usually related to acid reflux. In the controls, the mean peak pharyngeal pressure was 36 mm Hg; the mean upper-esophageal sphincter (UES) resting pressure was 39 mm Hg; UES relaxation to baseline esophageal pressure was complete in 95% of the swallows; and coordinated UES activity was observed in 98% of the swallows. The oropharyngeal dysphagia patients did not differ significantly from the controls with regard to peak pharyngeal pressures, but the mean UES resting pressure, percent UES relaxation, and percent UES coordination were significantly lower in the former. The cine-esophagrams showed abnormal mouth and tongue movements in seven patients, anatomically disorganized pharyngeal contraction in seven, abnormal UES relaxation in eight, and aspiration in five; initiation of a primary esophageal wave was normal in all but one patient. Peak pharyngeal monometric pressures did not correlate with the cine appearance of pharyngeal contraction; visual observations of the UES did not correlate well with manometric pressures; and the amount and site of aspiration did not correlate with the manometric measurements. However, manometry and cine study agreed in the evaluation of UES relaxation, UES coordination, and evaluation of primary peristalsis. Five patients underwent UES myotomy for severe intractable dysphagia, aspiration, and weight loss; although four patients improved clinically after surgery, the mean and maximum resting UES pressures and peak pharyngeal pressure did not change significantly. The data suggest that both cine-esophagography and manometry are necessary to properly evaluate the abnormalities associated with oropharyngeal dysphagia.

4301 EFFECT OF BILE SALTS ON THE IONIC PERMEABILITY OF THE ESOPHAGEAL MUCOSA AND THEIR ROLE IN THE PRODUCTION OF ESOPHAGITIS. *(E.)* Safie-Shirazi, S.; DenBesten, L.; Zike, W. L. (Univ. Iowa Coll. Med., Iowa City). *Gastroenterology* 68(4):728-733, 1975.

The effects of HCl and HCl plus bile salts on ionic movement across the mucosa of the distally occluded canine and human esophagus were measured to test the hypothesis that HCl, in concentrations secreted by the gastric mucosa, does not significantly penetrate or injure the esophageal mucosa unless its permeability to H+ is altered. Double lumen oroesophageal tubes were placed in the esophaguses of anesthetized mongrel dogs, after which the gastroesophageal junction was occluded and the esophagus was ligated just distal to the thyroid cartilage. A test solution (100 ml) containing 50 mEq/liter HCl with or without 2.5 mM bile salts was instilled into the proximally and distally occluded esophagus, where it was left for 0.5 or 4.5 hr. In two conscious human volunteers, the distal esophagus was occluded and 30 ml of test solution containing 100 mEq/liter HCl with or without 10 mM bile salts was instilled into the esophagus and left for 15 min. In the dogs there was a significant loss of H+ when bile salts were added to the test solution containing HCl. With HCl plus bile salts, but not HCl alone, a severe necrotizing esophagitis with loss of mucosa and submucosa was observed when the solution was left in the esophagus for 4.5 hr. In the human volunteers, the mean net losses of H+ from the esophagus increased five-fold in the presence of bile salts. The data indicate that the addition of bile to HCl significantly increases the loss of H+ and renders the esophageal mucosa more susceptible to inflammatory change. These observations suggest that the esophagitis and ulceration associated with intraesophageal bile and HCl may be due to increased permeability of the esophageal mucosa to H+ induced by bile salts.

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4353 THE TREATMENT OF ESOPHAGEAL CARCINOMA: A REPORT ON 267 CASES. *(Ger.)* Viikari, S. J.; Havia, T.; Inberg, M. V.; Scheinin, T. M. (Surg. Dep. Univ. Turku, Finland). *Zentralbl. Chir.* 99(43): 1358-1367, 1974.

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4355 THREE DIFFERENT RADIOTHERAPY TECHNIQUES FOR ESOPHAGEAL CARCINOMA. *(Ger.)* Eichhorn, H. J.; Lessel, A. (Cent. Inst. Cancer Res., Berlin, Germany). *Zentralbl. Chir.* 99(49):1544-1557, 1974.

4356 REFLUX ESOPHAGITIS REFRACTORY TO MEDICAL MANAGEMENT. *(E.)* Custer, H. R. (no affil.). *Abdom. Surg.* 17(6):145-153, 1975.

4357 POSTOPERATIVE CHYLOTHORAX. SIX CASES IN 2,500 OPERATIONS, WITH A SURVEY OF THE WORLD LITERATURE. *(E.)* Cevese, P. G.; Vecchioni, R.; D'Amico, D. F.; Cordiano, C.; Biasiato, R.; Favia, G.; Farello, G. A. (Sch. Med., Univ. Padua, Italy). *J. Thorac. Cardiovasc. Surg.* 69(6):966-971, 1975.

4358 CONGENITAL ESOPHAGEAL STENOSIS WITH LACK OF THE SUBMUCOSA. *(E.)* Takayanagi, K.; Ii, K.; Komi, N. (Tokushima Univ. Hosp., Japan). *J. Pediatr. Surg.* 10(3):425-426, 1975.

4359 PSEUDOTUMORAL VARICES OF ESOPHAGUS. *(E.)* Donner, D.; Esquerre, F.; Smulewicz, J. J. (Queens Hosp. Cent., N.Y.). *N.Y. State J. Med.* 75(6):898-899, 1975.

4360 ESOPHAGEAL CARCINOMA ARISING ON BARRETT'S EPITHELIUM. *(E.)* Alves, M. A.; Ellis, F. H.; Haggitt, R.; Colcher, H. (Lahey Clin. Found., Boston, Mass.). *Gastrointest. Endosc.* 21(4):183, 1975.

4361 ACHALASIA: A RETROSPECTIVE CORRELATION. *(E.)* Biederman, M. A.; Rinaldo, J. A.; Galzayd, E. (Providence Hosp., Southfield, Mich.). *Gastrointest. Endosc.* 21(4):183-184, 1975.

4362 STRANGULATED DIAPHRAGMATIC HERNIA. A CLINICAL STUDY. *(E.)* Christiansen, L. A.; Blichert-Toft, M.; Bertelsen, S. (Rigshosp., Copenhagen, Denmark). *Am. J. Surg.* 129(5):574-578, 1975.

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4364 INFLAMMATORY PSEUDOTUMORS (INFLAMMATORY FIBROUS POLYPS) OF THE ESOPHAGUS. A CLINICOPATHOLOGIC STUDY. *(E.)* LiVolsi, V. A.; Perzin, K. H. (Coll. Physicians Surg., Columbia Univ., New York, N.Y.). *Am. J. Dig. Dis.* 20(5):475-481, 1975.

4365 PROLAPSE OF THE GASTROSTOMY CATHETER IN CHILDREN. *(E.)* Currarino, G.; Votteler, T. (Child. Med. Cent., Dallas, Tex.). *Am. J. Roentgenol. Radium Ther. Nucl. Med.* 123(4):737-741, 1975.

See also, 4187, 4195, 4200, 4211, 4216, 4217, 4218, 4421, 4447, 4486, 5054, 5062, 5089, 5094, 5126, 5185.

STOMACH

4366 GASTRIC CONSEQUENCES OF LONGTERM HYPERCAPNIA IN THE RAT. *(Fr.)* Reichart, E.; Guerrin, F.; Gosselin, B. (Fac. Med., Lille, France). *Biomedicine* 20(5):366-373, 1974.

Continuous hypercapnia without hypoxia was induced in 78 Wistar rats by allowing them to breathe a mixture containing 8 or 10% CO_2 for 1-6 weeks. Some rats were also subjected to a mild hypoxia (17-18%) for 3 days and some had the hypercapnia interrupted for 1 or 7 days before they were sacrificed . Gross and microscopic examinations of the stomachs showed changes in the gastric mucosa in 53/56 rats subjected to hypercapnia for 15 days. Abnormalities included catarrhal or hemorrhagic gastritis, frequent and large areas of desquamation, erosions, and a few ulcerations. Hypercapnia of more than 15 days duration increased desquamation and produced superficial retraction of the mucosa. Hypoxia only mildly aggravated the symptoms, and when the hypercapnia had been discontinued 7 days prior to sacrifice, most lesions had disappeared. It is suggested that local changes in the microcirculation cause most of the gastric lesions, and these results may help clarify gastrointestinal complications which may occur during respiratory insufficiency in man.

4367 HISTOCHEMICAL STUDIES OF ACID PHOSPHATASE IN TUMOR CELLS OF GASTRIC CARCINOMA. *(Rus.)* Dikshtein, E. A.; Vasilenko, I. V. (Donetsk Med. Inst., USSR). *Arkh. Patol.* 36(11):67-72, 1974.

Histochemical studies of the activity of acid phosphatase with β-glycerophosphate at pH 6.0 in 40 gastric tumors (17 adenocarcinomas, six solid cancers, 17 undifferentiated polymorphocellular and mucous cancers) revealed three groups of tumors: with weak (12), moderate (13) and high (15) activity of the enzyme. Phosphatase activity was correlated with the content of fat, total protein, SH-group protein, RNA and amount of mucous secretion in the tumor cells. Undifferentiated tumors appeared to have higher acid phosphatase activity than adenocarcinomas. No direct correlation was found between acid phosphatase and total protein or SH-groups, while a high acid phosphatase activity was accompanied by a low RNA content in the cytoplasm of the tumor cells. It is suggested that acid phosphatase is involved in autolysis, but its involvement in secretion is less obvious; there is an inverse correlation between enzyme and protein synthesis. It is concluded that the activity of acid phosphatase is more indicative of early dystrophic changes in the tumor cells than the amount and distribution of fat.

4368 HISTOLOGICAL AND HISTOCHEMICAL FEATURES OF THE STROMA IN STOMACH CANCER. *(Rus.)* Zolotarevskii, V. B.; Vorobieva, A. A. (1st Moscow Med. Inst. USSR). *Arkh. Patol.* 36(11):61-67, 1974.

Studies were performed on 60 resected stomachs with adenocarcinoma (15), solid cancer (18) and glandular (6), scirrhus (9), undifferentiated (10), and mixed (2) tumors. Three types of stroma were identified. (1) Vascular stroma, found in undifferentiated tumors and adenocarcinomas, consisted of narrow interlayers with small lymph and blood vessels surrounded by a few argyrophilic and collagen fibers and a small number of fibroblasts. No deposits of acid or neutral mucopolysaccharides (MPS) were observed. (2) Granulation tissue-type stroma was identified in all histological types of cancer. It is generally densely infiltrated with leukocytes, plasma cells, histiocytes and lymphoid cells. Acid MPS are either nonexistant or are present in very small amounts. The connective tissue and fibers of the stroma were indicative of immaturity and precollagen and collagen fiber formation. (3) Fibrous stroma was observed in adenocarcinoma and solid and scirrhus tumors. Most collagen fibers stained readily with fuchsin. Fibrous stroma always contained neutral and acid MPS in the interlayers where active synthesis of collagen occurs. The findings suggest a correlation between the presence of fat cells near the tumor and the accumulation of acid MPS in the stroma. Fibroblast proliferation and the increased MPS content in parts of the stomach near the tumor suggest the stroma develops before infiltration of cancer cells.

4369 GASTRIC ULCERATION IN THE PIG SUBJECTED TO HAEMORRHAGIC SHOCK. *(E.)* Kivilaakso, E.; Kalima, T. V.; Lempinen, M. (Second Dep. Surg., Univ. Helsinki, Finland). *Scand. J. Gastroenterol.* 9(7):685-690, 1974.

The mechanism of ulcerogenesis and the roles of transient mucosal ischemia, gastric reflux of bile, and disruption of the mucosal barrier to the backdiffusion of H^+ in the pathogenesis of stress ulcer were studied in 17 piglets. The fasted piglets were subjected to hemorrhagic shock produced by bleeding from a cannulated femoral artery. The gastric motility and the development of the mucosal changes during the shock period and shortly afterwards were followed by endoscopy. Mucosal lesions developed in all but 1 of the 12 piglets which survived the 3 hr of hemorrhagic shock. Endoscopic examination during exsanguination showed inhibition, followed by complete cessation of gastric motilin; this in turn was followed by a copious reflux of bile and the duodenal contents into the stomach. The first mucosal changes, seen soon after the establishment of shock, comprised a network of ischemic and hyperemic areas with extravasation of blood. Toward the end of the shock period, small mucosal hematomas developed within these areas. After transfusion of blood through a femoral vein, these areas became intensely red-colored with transient focal hemorrhages and, later, small superficial erosions were seen. More extensive lesions, confined almost exclusively to the body of the stomach, were seen 24 hr after the cessation of shock; these lesions included 'punched-out' ulcers, superficial ulcerations, and areas of hemorrhagic gastritis. The results indicate that the bleeding shock model is a reproducible and reliable method of inducing stress ulcers in piglets. They also suggest that capillary injury, transient mucosal ischemia, and the gastric reflux of bile and/or the duodenal contents are important factors in the genesis of gastric stress ulcers.

4370 DOUBLE-BLIND STUDY ON THE TREATMENT OF GASTRIC ULCER WITH CARBENOXALONE.

(Fl.) van Camp, F.; Standaert, L. (St. Elisabeth Hosp., Antwerp, Belgium). *Tijdschr. Gastroenterol.* 17(1):51-63, 1974.

A double-blind trial of carbenoxalone was performed on 36 patients with gastric ulcers. Patients with hypertension, cardiac decompensation, and renal damage were excluded, as were four patients who were later found to have stomach cancer, one whose treatment had to be discontinued because of acute appendicitis, and another who stopped taking his medicine. Of the remaining 30 patients, 13 had primary gastric ulcers while 17 were being treated for secondary ulcers or recurrences. This trial was performed on 21 hospitalized patients and six outpatients; three were treated as both inpatients and outpatients. Carbenoxalone was administered to 14 patients in doses larger than those usually recommended: 400 mg/day for the first 2 weeks and 200 mg/day for the next 4 weeks; controls consisted of 16 patients who received placebos. Complete disappearance of the ulcer or a scar with an area of 2 mm^2 at most, as seen on radiological or gastroscopic examination, was observed in eight (66%) of carbenoxalone-treated patients and six (43%) of the controls; improvement occurred in one (8%) and four (29%), resp.; no change was observed in three (25%) and three (21%), resp.; and the condition of one of the controls (7%) became worse. After 3 months of carbenoxalone therapy, 10 (83%) of the carbenoxalone-treated patients were completely recovered. After 6 weeks of therapy, no appreciable difference in weight gain was observed between the two groups, but there was a clearly increased tendency for carbenoxalone-treated patients to retain water and develop edema. It was not clear whether increased ingestion of milk or the presence of sodium bicarbonate in antacids might have contributed to the edema. Reversible increases in blood pressure occurred in two treated patients. Serum sodium concentrations increased in nine (63%) of the treated patients and in six (37%) of the controls, while serum potassium levels decreased in 10 (70%) of the treated patients and in five (36%) of the controls. These changes in serum electrolytes are attributed to water retention which was most pronounced in patients who responded the most rapidly to carbenoxalone. Increases in serum transaminase values, which occurred primarily during week 2 or 3 of treatment, occurred in 12 treated patients and in only two controls; these values later returned to their initial levels.

4371 ENDOSCOPIC FOLLOW-UP OF GASTRIC POLYPS.

(E.) Mizuno, H.; Kobayashi, S.; Kasugai, T. (Aichi Cancer Cent. Hosp., Nagoya, Japan). *Gastrointest. Endosc.* 21(3):112-115, 1975.

The course and malignant changes in a series of 118 patients with gastric polyps (benign) were followed over a period of 1-6.5 yr using endoscopy and histopathological techniques. Of these cases, 114 remained benign and 4 showed malignancy in the final histologic examination. Endoscopic findings in the benign group (61 men and 53 women, average age 54.2 yr) indicated that the rate of morphological change increased with increasing period of observation. The polyps tended to grow over a period of several yr and thereafter remain at about the same size (within 2 cm); in some patients a similar, but reverse, trend was observed. Among the malignant group was a 50-year-old man with a sessile polyp and a pedunculated polyp. The latter increased moderately in size with gradual lobulation; the histological picture suggested an adenocarcinoma engrafted on a polypoid adenoma. In the remaining patients (62- and 64-year-old men and a 63-year-old woman), 2 sessile polyps and a polyp of the lower body of the stomach eventually revealed adenocarcinoma. The results suggest that endoscopic follow-up of benign gastric polyps is justified in that malignant change may occur in a small number of cases.

4372 THE USE OF METOCLOPRAMIDE IN ACUTE PYLORIC OBSTRUCTION: A CLINICAL TRIAL.

(E.) Zer, M.; Dintsman, M. (Beilinson Hosp., Petah Tiqva, Israel). *Am. J. Gastroenterol.* 63(3):232-239, 1975.

Twelve patients (8 men and 4 women, aged 14-68 yr) with complete or partial pyloric obstruction were treated with metoclopramide in an attempt to improve their preoperative state, facilitate radiography, and permit elective surgery. All cases presented with repeated intractable vomiting and would have required urgent surgery. After initial treatment by gastric decompression, i.v. fluids, and electrolyte replacement, 10 mg metoclopramide were administered i.v. or i.m. 3 times daily. Drainage from the gastric tube was measured. After 24 hr an attempt was made to close the gastric tube, withdraw it, and begin p.o. feeding. The drug was continued with a p.o. dose of 30-60 mg/day. If tube removal was unsuccessful, the drug dose was doubled. If this failed to improve the patient's condition, surgery was performed as soon as possible. Of the 12 patients, 8 (66.6%) had very good results; vomiting stopped and p.o. feeding was resumed. Six later had surgery, and diagnosis of duodenal ulcer with severe pyloric stenosis was confirmed. Two cases (16.6%) had good results; vomiting stopped, but severe epigastric discomfort continued, preventing p.o. feeding. In the final two cases, results were poor; the attempts to withdraw the gastric tube failed and semiemergency surgery was performed. Severe scarring and complete pyloric obstruction were found. It is concluded that metoclopramide may effectively improve gastric emptying, sometimes even in complete pyloric obstruction, and allow patients better preparation for surgery.

4373 ROENTGEN PROBLEMS IN EVALUATING THE ATROPHIC STOMACH OF THE ELDERLY.

(E.) Bryk, D.; Elguezabai, A. (Jewish Hosp. Med. Cent. Brooklyn, N.Y.). *Am. J. Roentgenol. Radium Ther. Nucl. Med.* 123(2):236-241, 1975.

Radiological simulation by gastric atrophy of other conditions was reviewed in 17 patients, 65-89 yr. In eight cases, scirrhous carcinoma of the distal stomach was simulated. Radiograms showed limited distensibility of the stomach with straightening of the lesser and indentations of the greater curvature. Peristalsis was absent or minimal. In two cases there was a scalloped, coarse irregularity of the distal greater curvature. Biopsies in four cases showed absence of malignancy. In six of the 17 cases, gastric retention of food after an overnight fast falsely indicated gastric outlet obstruction. Barium study in these cases showed normal peristalsis with no delay of pyloric opening or gastric emptying. The usual features of gastric atrophy were observed. In three of the cases, there was gastric retention of p.o. cholecystographic medium 14 hr after ingestion. Again, roentgen studies showed features of gastric atrophy, but no delay in pyloric opening or gastric emptying. It is suggested that physicians be aware of such problems in roentgen diagnosis.

4374 EFFECT OF NAPROXEN ON GASTROINTESTINAL MICROBLEEDING FOLLOWING ACETYLSALICYLATE MEDICATION.

(E.) Arsenault, A.; Varady, J.; LeBel, E.; Lussier, A. (Cent. Hosp. Univ., Sherbrooke, Quebec, Canada). *J. Clin. Pharmacol.* 15(4):340-346, 1975.

Naproxen was substituted for acetylsalicylic acid to determine its influence on salicylate-induced gastrointestinal bleeding. Normal volunteers (12) were given increasing doses of salicylate until guaiac tests were positive. Venous blood (16 ml) was drawn, incubated with 200 μCi sodium chromate 51, and the labeled erythrocytes washed and reinjected into the subjects. For the first two weeks of the study, subjects were continued on 2.7-4.5 g/day of acetylsalicylic acid. For the last 2 weeks, the acetylsalicylic acid was stopped; six subjects were given 250 mg naproxen twice daily, and 6 were given a placebo in a double-blind design. Stools were collected on the last three days of each week, and 5 ml of blood was drawn at the beginning and end of each collection period. All samples were counted in a well-type gamma counter. Blood in the stools was quantitated by dividing the net counts/min in the total specimen by the net counts/min/ml blood. The placebo group showed a clear-cut drop in blood loss. A two-way analysis of variance showed a highly significant non-additivity of the Tukey type. On a natural logarithmic scale, the only significant contrast was weeks on acetylsalicylic acid *versus* weeks on placebo therapy. In the naproxen group, there was also a clear-cut difference between weeks on acetylsalicylic acid and weeks on naproxen. Two-way variance analysis showed significant non-additivity. Analysis on a logarithmic scale showed a highly significant contrast between microbleeding during acetylsalicylic acid and naproxen treatment. There was no consistency between acetylsalicylic acid dose and level of microbleeding in either the naproxen or placebo groups. It is concluded that substitution of naproxen for acetylsalicylic acid will significantly reduce microbleeding to near normal levels.

4375 GASTRIC MUCOSAL MORPHOLOGY IN TROPICS AND INFLUENCE OF SPICES, TEA, AND SMOKING.

(E.) Tyagi, K. P.; Mukhopadhyay, A. K.; Agarwal, H. N.; Naik, S. R.; Malik, G. B.; Gupta, D. N.; Chuttani, H. K. (Maulana Azad Med. Coll., New Delhi, India). *Nutr. Metab.* 17(3):129-135, 1974.

Gastric mucosal morphology in the tropics was studied to compare the frequency of gastritis in normal and dyspeptic subjects, and to determine the effects of spices, tea, and tobacco. The dyspeptic group consisted of 82 patients with symptoms suggestive of gastritis, while 6% normal adults served as controls. Peroral gastric biopsies were done in all subjects as well as barium meal examinations. Subjects received either a calculated diet or diet was determined by questionnaire. The amount of spices consumed was calculated by dividing the total amount consumed/family/month by the number of members/family. Spices included *Capsicum frutescens, Elettaria cardamomum, syzigium, armalicum, and Coriandrum sativum.* Tea and cigarette consumption was assessed by questionnaire. Changes of chronic gastritis were significantly higher in the patients (42 of 82) than in the controls (23 of 76). Both superficial and atrophic gastritis were more common in the patients; no subject, patient or control, had gastric atrophy. No radiological evidence of gastroduodenal ulceration was found in either group. Radiological grading of the folds showed 16 of 41 controls and 17 of 31 patients had abnormal folds. No significant differences were noted between moderate and heavy spice consumers in morphological changes of gastritis, or between moderate and heavy tea drinkers. There was no significant difference in occurrence of gastritis between smokers and non-smokers. It is concluded that spices, tea, and smoking are not correlated with occurrence of gastritis.

4376 ROLE OF TAUROCHOLIC ACID IN PRODUCTION OF GASTRIC MUCOSAL DAMAGE AFTER INGESTION OF ASPIRIN.

(E.) Cochran, K. M.; Mackenzie, J. F.; Russell, R. I. (R. Infirm., Glasgow, Scotland). *Br. Med. J.* 1(5951):183-185, 1975.

The possibility that aspirin-induced gastric mucosal damage may occur more readily in the presence of ile was studied in 22 healthy subjects. The subects were fasted overnight and a nasogastric tube ith a probe electrode attached was passed into the ody of the stomach. The gastric transmucosal elecrical potential difference (E.P.D.) was measured fter the stomach had been emptied of any resting ecretion, in the presence of 50 ml of normal saline, nd in the presence of aspirin (600 mg suspended n 50 ml of normal saline) and/or taurocholic acid TCA, 5 mM/liter in normal saline solution). After he introduction of acetylsalicylic acid in 7 subects the mean E.P.D. fell significantly, from a aseline value of -33.3 mV to -17 mV. After the ntroduction of TCA in 7 additional subjects, the ean E.P.D. again fell significantly, from a baseine value of -38.1 mV to -19.1 mV. The mean duraion of the changes following aspirin and TCA adminitration was 14.4 and 17.5 min, resp. When 8 addiional subjects were administered a combination of spirin and TCA, the mean E.P.D. fell from a baseine value of -38.6 mV to -17.9 mV, but the mean uration of this change (27 min) was significantly onger than that after either agent alone. These esults indicate that the ingestion of aspirin, ogether with coincidental reflux of bile from the uodenum, may be a factor in the pathogenesis of spirin-induced gastric mucosal damage.

4377 NARCOTIC ANALGESICS AND DELAYED GASTRIC EMPTYING DURING LABOUR. *(E.)* Nimmo, W. .; Wilson, J.; Prescott, L. F. (R. Infirm., Edinburgh, Scotland). *Lancet* 1(7912):890-893, 1975.

The effects of pethidine, diamorphine (heroin), pentazocine, and metoclopramide on gastric emptying during labor were studied in 56 patients. The women were receiving pethidine (150 mg), diamorphine (10 mg), pentazocine (60 mg), and/or metoclopramide (10 mg) i.m. as needed. Paracetamol (acetaminophen, 1.5 g) was given p.o. at varying times in relation to the narcotic injections and the imminence of delivery. The rate of gastric emptying was measured indirectly based on the kinetics of absorption of the paracetamol. The absorption of paracetamol was also studied 2-5 days postpartum in 10 patients who had received narcotics during delivery. Paracetamol absorption was normal in the postpartum patients and in a control group during delivery. Pethidine and diamorphine significantly reduced the absorption of paracetamol as judged by the plasma-paracetamol concentrations 2 hr after ingestion and the time taken to reach maximum levels. Paracetamol absorption was also markedly delayed in the women taking pentazocine and metoclopramide; the latter drug did not significantly enhance the rate of paracetamol absorption in the patients taking pethidine or diamorphine. There was no relation between delayed paracetamol absorption and the parity of the patients or the administration of cyclizine or oxytocin. The results suggest that the use of pethidine, diamorphine, or pentazocine for the relief of pain in labor may be a major factor responsible for maternal death due to delayed gastric emptying; patients treated with narcotics will also be more likely to vomit or to have increased gastric contents, and they are unlikely to be helped by metoclopramide.

4378 GASTRIC SECRETION IN HYPERPARATHYROID SUBJECTS BEFORE AND AFTER SURGERY. *(E.)* Johansson, H.; Furberg, B.; Krause, U.; Lundqvist, G.; Rimsten, A. (Univ. Hosp., Uppsala, Sweden). *Ups. J. Med. Sci.* 79(3):155-160, 1974.

The effects of parathyroidectomy on the gastric secretion and plasma gastrin levels in patients with hyperparathyroidism were studied. Patients with histologically verified hyperparathyroidism (61) were studied; 41 were preoperatively hypercalcemic, while 20 appeared to be preoperatively normocalcemic. Symptoms of gastritis and/or peptic ulcer disease were present in 11 patients. The gastric secretion rate and hydrogen ion concentration were measured after histamine-stimulation before and 4 weeks after parathyroidectomy. The serum gastrin content was measured by a solid-phase radioimmunoassay. In all patients, the serum calcium level decreased after surgery, the levels being independent of the presence or absence of peptic ulcer disease. Achylia after submaximal histamine stimulation was found in one normocalcemic patient and six hypercalcemic patients, and hypochylia was found in a similar number of patients. The gastric output did not differ significantly before and after surgery in either group, and the preoperative values were of the same magnitude in the two groups. The sialic acid content in the gastric juice also did not change after surgery, but the values were consistently lower in the normocalcemic patients than in the hypercalcemic patients. The serum gastrin level was not influenced by parathyroidectomy. The clinical results suggest that performing parathyroid surgery before surgical treatment of ulcer disease in hyperparathyroid patients with peptic ulcer may be of value.

4379 HEMORRHAGE DUE TO DIFFUSE EROSIVE GASTRITIS. *(E.)* Stremple, J. F.; Elliott, D. W. (Univ. Pittsburgh Sch. Med., Pa.). *Arch Surg* 110 (5):606-612, 1975.

Operative experience (5 yr) with bleeding erosive gastritis is reviewed to help define the safest and most effective surgical approach. Of 796 patients admitted with upper gastrointestinal bleeding during this period, 156 had erosive gastritis. Vigorous nonoperative therapy stopped the bleeding in 117 cases. This treatment program consisted of iced saline lavage, transfusion with packed red blood cells, platelets, or whole blood, vitamin K administration where indicated, antacid administration *via* gastric tube, parenteral anticholinergic therapy, and endoscopic examination. In 39 cases, emergency operations were performed to control hemorrhage. In 24 of these patients (group A), subtotal gastric resection with truncal vagotomy was performed, and in the remaining 15 patients (group B), the operation was limited to pyloroplasty, truncal vagotomy, and multiple suture ligation. The group B patients were, on the average, 20 yr older than the group A patients, and 12 had life-threatening preoperative problems as compared with only four patients in group A. The operative mortality in group A was 42%, with recurrent bleeding occurring in 33%. In group B, only 17% showed recurrent bleeding and the operative mortality was 45%. More than half the deaths in group B were due to sepsis which was present preoperatively. Rebleeding was the cause of death in 33.3% of the group A fatalities and in none of the group B fatalities. The results indicate that truncal vagotomy with pyloroplasty and multiple suture ligation is a good choice of operation in the high-risk and elderly patient in whom the main issue is immediate salvage of life in the face of potential exsanguination.

4380 GASTRIC MUCOSAL CHANGES IN IDIOPATHIC AND POST-HAEMORRHAGIC IRON DEFICIENCY ANAEMIA - A COMPARITIVE STUDY. *(E.)* Gupta, S. P.; Arya, R. K. (Med. Coll., Rohtak, India). *Indian J. Med. Res.* 62(11):1751-1756, 1974.

Gastric morphological and acid-secretory patterns were studied in 20 cases of idiopathic iron deficiency anemia (Group A) and compared with those observed in age- and sex-matched cases of post-hemorrhagic iron deficiency anemia (Group B). The histamine-stimulated acid output was determined and mucosal changes were studied in gastric biopsy specimens. Gastric musocal abnormalities were present in 4/5 of the patients in both groups: atropic gastritis was slightly more common in group A and superficial gastritis was slightly more common in group B. Histamine-fast achlorhydria was present in seven males and two females in group A and six females in group B. The prevalence of gastric abnormalities did not vary significantly with age or sex in either group, although atrophic gastritis was significantly more common in women than in men. The results suggest that the nature of the association between iron deficiency and gastric mucosal lesions is similar in the post-hemorrhagic and idiopathic types of iron deficiency anemia, but that the factors responsible for the negative iron balance are overt in the formen and more subtle in the latter condition. A greater chronicity of iron deficiency may be associated with more severe and permanent gastric changes.

4381 AN ENDOSCOPIC EVALUATION OF THE EFFECTS OF NON-STEROIDAL ANTI-INFLAMMATORY DRUGS ON THE GASTRIC MUCOSA. *(E.)* Lanza, F.; Royer, G.; Nelson, R. (Baylor Coll. Med., Houston, Tex.). *Gastrointest. Endosc.* 21(3):103-105, 1975.

The effects of placebo (lactose, q.i.d.), phenylbutazone (100 mg, q.i.d.), aspirin (900 mg, q.i.d.). indomethacin (25 mg, q.i.d.), and ibuprofen (a new, nonsteroidal antiinflammatory agent) (300 mg, q.i.d.) on the gastric mucosa were studied in a prospective, single-blind crossover study on 20 normal volunteers. All drugs were given for 7 days. Stool were examined periodically by the guaiac method and the gastric mucosa was evaluated directly before and after drug treatment by endoscopy at the time of gastroscopy. Varying degrees of erythrema, edema, petechial hemorrhage, and gastric erosions were seen with all 4 drugs, the most severe abnormalities being observed with aspirin and indomethacin. The abnormalities caused by ibuprofen were significantly less severe than those induced by aspirin and indomethacin. With aspirin and indomethacin, the degree of mucosal injury was more severe than the subjective symptoms recorded by the subjects; with phenylbutazone, there was almost a direct linear correlation between symptoms and endoscopic findings; and with ibuprofen, there was little mucosal abnormality and minimal subjective symptoms. All drugs were absorbed to a significant extent, and none caused gastrointestinal bleeding, blood chemistry aberrations, or hematologic changes. The findings support previous data indicating minimal gastric mucosal injury with ibuprofen. They also suggest that the cause of sudden painless gastrointestinal bleeding in patients taking antiinflammatory drugs is acute hemorrhagic gastritis.

4382 HEMORRHAGIC EROSIVE GASTRITIS: A CLINICAL STUDY. *(E.)* Lee, E. R.; Dagradi, A. E. (Kaiser-Permanente Bellflower Med. Cent., Calif.). *Am. J. Gastroenterol.* 63(3):201-208, 1975.

The incidence of hemorrhagic erosive gastritis was studied in 400 consecutive patients from a civilian general hospital (over a 7-yr period) presenting with upper gastrointestinal hemorrhage. Age and sex distribution was representative of the general population; race and socio-economic status was a cross section of Southern California. All were examined by endoscopy. Hemorrhagic erosive gastritis was found in 74 of the patients (18.5%), of whom 53 were male and 21 female. This occurred despite a preponderance of female patients (61.8% female versus 38.2% male over a 1-yr period) at the hospital. Of the 74, 55 (74%) had a history of alcohol or salicylate intake. In relating sex distribution to etiologic agent, males were predominant, but no appreciable age difference existed between the sexes in relation to the etiologic agent. Additional peptic lesions were found in 32 patients (43%) and gastric ulcers in 15. In 45 of 54 patients, inflammatory mucosal disease was present, and five had hypertrophic hypersecretory gastropathy. Eleven patients had previously undergone surgery for peptic ulcer. There was a 5% mortality; 2 patients died of hepatic failure, 1 from ruptured esophageal varices, and 1 from fulminant serum hepatitis. This study corroborates findings of a previous all-male VA hospital study. It is concluded that in hemorrhagic erosive gastritis there is a preponderance of males affected, alcohol and/or salicylate is the most common offending agent, and the disease is commonly associated with other gastric mucosal abnormalities.

4383 EARLY GASTRIC CANCER - EXPERIENCE IN GERMANY. *(E.)* Elster, K.; Kolaczek, F.; Shimamoto, K.; Freitag, H. (Munic. Hosp., Bayreuth, Germany). *Endoscopy* 7(1):5-10, 1975.

Cases of early gastric cancer (87) were analyzed and a technique described which allows easy correlation between histological pattern and gross observation. Cases from 1969-1973 were studied; the term early cancer marked not only the spread of invasion but a diagnosis made early in life span. The differentiation between mucosal and submucosal invasion was found to be of special importance in regard to prognostic evaluation of early gastric cancer. Signet ring cell carcinoma was more common in younger age; highly differentiated adenocarcinoma predominated in old age. In 69 of 87 lesions, the first biopsy confirmed the diagnosis of carcinoma. The data suggest that by intensifying gastroscopic biopsy the frequency of diagnosed early cancers will increase.

4384 BENEFICIAL EFFECT OF HUMAN GROWTH HORMONE ON STRESS ULCERS. *(E.)* Winawer, S. J.; Sherlock, P.; Sonenberg, M.; Vanamee, P. (Mem. Sloan-Kettering Cancer Cent., New York, N.Y.). *Arch. Intern. Med.* 135:569-572, 1975.

The potential value of human growth hormone in controlling hemorrhage from stress ulcers was evaluated in 8 patients who had undergone massive upper gastrointestinal tract hemorrhage from verified stress ulcers. Growth hormone was administered i.m. at 10 mg/kg/day for 6 days or until bleeding stopped. Untreated patients with stress ulcer hemorrhage served as controls. Human growth hormone was effective in healing erosions and controlling hemorrhage in 6 of the 8 stress ulcer patients; 2 other patients died during the study, 1 from sepsis and the other from cardiac arrest. Among the patients who responded to treatment, 3 required 4 days of hormone treatment, 2 required 6 days of treatment, and 1 required 18 days of treatment. In the control group, 6 of 8 patients died with continued bleeding. In the patients who responded to hormone treatment, blood urea nitrogen levels were consistently reduced, but the effects on blood sugar, phosphorus, and fibrinogen levels were inconsistent. Although these observations must be extended to additional stress ulcer patients in a larger randomized study, they support data from animal studies and suggest a possible role of human growth hormone in the treatment of human stress ulcers.

4385 PATHOPHYSIOLOGY OF STRESS ULCER AND ITS PREVENTION. I. PHARMACOLOGIC DOSES OF STEROID. *(E.)* Kawarda, Y.; Weiss, R.; Matsumoto, T. (Hahnemann Med. Coll. Hosp., Philadelphia, Pa.). *Am. J. Surg.* 129:249-254, 1975.

The efficacy of large doses of the dexamethasone in the prevention of stress ulcer formation in restrained rats was studied by microangiohistologic techniques. Fasted male Wistar rats were restrained and kept at 4 C for 2 hr. Some of the animals were pretreated (0.1 mg/kg/day for 7 days, or 10 mg/kg 24 hr before restraint) or posttreated (10 mg/kg immediately after restraint) with dexamethasone. Four hr after restraint, the animals were examined for ulcers. In a second study, a double-color perfusion technique was used to study the morphologic changes in the stomach 4 hr after restraint. Compared with the untreated controls, the incidence and severity of ulcers was significantly reduced in the rats pretreated with 10 mg/kg steroid 24 hr before restraint. The other pretreatment group and the posttreatment group did not differ significantly from the controls in terms of ulcer incidence or severity. The microfile perfusion study showed vasoconstriction and focal ischemia in the gastric mucosa of the control group, the posttreatment group, and the group pretreated with 0.1 mg/kg/day steroid for 7 days. Although small areas of ischemia were seen in the group pretreated with a 10 mg/kg dexamethasone, the findings in this group were similar to those in the normal stomach. The results indicate that a large dose of dexamethasone may protect against vasoconstriction, increase inotropic action under conditions of stress, or inhibit damage to gastric cell membranes when given prior to the development of a stress ulcer.

4386 ACUTE GASTRIC MUCOSAL DAMAGE INDUCED BY BILE SALTS, ACID, AND ISCHEMIA. *(E.)* Ritchie, Jr., W. P. (Univ. Virginia Med. Cent., Charlottesville). *Gastroenterology* 68(4):699-707, 1975.

The ulcerogenic potential of topically applied acid and bile salts, alone and in combination with vasopressin-induced mucosal ischemia, was studied. In two groups of healthy adult dogs, vascularized full thickness wedges of a gastric wall were mounted in lucite chambers, and, with mucosa directly visualized, were studied during three consecutive 30-min periods. Group A (five dogs) was subjected sequentially to: topical acid test solution (ATS); ATS plus vasopressin (VP; 0.1 U/kg/min); and ATS plus VP plus 5mM sodium taurocholate (TC). Group B (five dogs) was subjected to ATS, ATS plus TC, and ATS plus VP plus TC. Three groups of controls were also studied: group A^1 were subjected to ATS plus VP during periods 2 and 3; group B^1 was subjected to ATS plus TC during periods 2 and 3; and group C was subjected to topical "neutral" test solution (NTS, 160 mM NaCl), NTS plus TC, and NTS plus VP plus TC. During each period, the net fluxes in volume, H^+, and Na^+, the electrical potential difference, and theaminopyrine clearance, a measure of gastric mucosal blood flow, were determined. Mucosal damage was assessed by an independent observer using photographs obtained after each period. The results indicated that significant lesion formation occurred only in the presence of acid, bile salts, and ischemia, No lesions were noted during any period in the control animals. The data suggest that lesion formation was not a function of either back diffusion of H^+ or of mucosal ischemia, *per se*. Relative to period 1, mucosal blood flow was significantly increased in non-ischemic mucosa exposed to bile salts during vasopressin infusion. Perhaps as a consequence, the combination of mucosal ischemia and topically applied acid and bile salts is severely, acutely, and uniquely ulcerogenic.

4387 ENZYMOLOGICAL CHANGES IN ABNORMAL DIFFERENTIATION: INTESTINAL METAPLASIA IN HUMAN GASTRIC MUCOSA: A POSSIBLE PRECANCEROUS CHANGE. *(E.)* Sugimura, T.; Kawachi, T.; Kogure, K.; Tokunaga, A.; Tanaka, N.; Sasajima, K.; Koyama, Y.; Hirota, T.; Sano, R. (Natl. Cancer Cent. Res. Inst., Tokyo, Japan). *Proc. Third Int. Symposium Princess Takamatsu Cancer Res. Fund, Japan* 251-261, 1973.

The patterns of four intestine-specific enzymes (sucrase, maltase, trehalase, and lactase) in the stomach mucosa were compared with the histological findings in 134 cases of resected stomach. Samples of stomach mucosa obtained at gastrectomy were treated with solutions of 5% sucrose, maltose, or trehalose and incubated to allow formation of glucose from disaccharides. The mucosal surface was then covered with Tes-Tape, which turned the mucosa green in the presence of disaccharides. Negative reactions for sucrase were obtained in 117 cases of stomach carcinoma, but in 96 cases, the cancer areas were surrounded by tissue giving a positive reaction for sucrase. Two patterns of intestinalization were found: In type A, there were positive reactions for sucrase, maltase, trehalase, and alkaline phosphatase with goblet cells and Paneth cells; and in type B, there were positive reactions for maltase and sucrase with goblet cells, but with negative reactions for trehalase and alkaline phosphatase and no paneth cells. Of the specimens examined, 1/3 showed type A intestinalization, 1/3 showed type B, and 1/3 showed both. In the latter cases, type A intestinalization was generally found in the antral region of the stomach and type B was found in the oral region. Intestinalization might be understood in two ways: it may be an obligatory process in cancerization of the stomach mucosa cells; or the stomach epithelium might be converted to a metastable, unidentified state from which both cancer and intestinalization may arise. At present, it is uncertain which of these possibilities is more likely.

4388 PATHOGENESIS OF GASTRIC LESIONS INDUCED BY ASPIRIN IN THE PYLORUS-LIGATED RAT. *(E.)* Okabe, S.; Takeuchi, K.; Nakamura, K.; Takagi, K. (Fac. Pharm. Sci., Univ. Tokyo, Japan). *Jpn. J. Pharmacol.* 24(3):363-371, 1974.

A standard method for the production of aspirin-induced gastric lesions in rats was elaborated and the mechanisms responsible for the deleterious effects of aspirin were investigated. Male Donryu rats were left unoperated or subjected to laparotomy or pylorus ligation. Immediately after surgery, aspirin (100 mg/kg) and/or 1% carboxymethylcellulose (CMC) solution was administered by gastric intubation. The animals were injected i.v. with pontamine sky blue 6 BX 7 hr later, then sacrificed and the stomachs examined for signs of hemorrhage. In other experiments, sodium bicarbonate, L-glutamine, amylopectine sulfate, sulfated glyptide, or atropine sulfate was administered by gastric intubation after surgery and before aspirin treatment. Compared with unoperated rats, laparotomy significantly reduced the incidence of stomach lesions and pylorus ligation significantly enhanced it. The aspirin-induced lesions in the pylorus ligated animals consisted of severe hemorrhagic erosions of various sizes and nonhemorrhagic mucosal defects. Sodium bicarbonate and L-glutamine strongly inhibited the hemorrhagic effects of aspirin; amylopectine sulfate and sulfated glyptide had less pronounced but significant inhibitory effects; and atropine sulfate had no significant inhibitory effects. Aspirin alone significantly reduced the gastric acidity and had no effect on pepsin activity. Sodium bicarbonate, alone or with aspirin, reduced both the acidity and pepsin activity. L-glutamine, alone or with aspirin, reduced the pepsin activity and increased the gastric acidity. Given with aspirin, amylopectine sulfate and sulfated glyptide reduced the pepsin activity and the gastric acidity. Atropine sulfate had no effect on pepsin activity or gastric acidity. These findings suggest that the effect of pylorus ligation on aspirin-induced gastric lesions is due to the increased acidity induced by the former, that L-glutamine may inhibit the aspirin-induced back diffusion of HCl into the gastric mucosa, and that pepsin plays a minor role in the production of aspirin-induced gastric lesions.

4389 CYTOLOGICAL DIAGNOSIS OF CARCINOMA OF THE STOMACH. *(E.)* Sivanagimani, R.; Reddy, D. B.; Raju, G. C. (Med. Coll., Kurnool, India). *Indian J. Cancer* 11(4):433-436, 1974.

The value of cytodiagnosis in gastric cancer was studied using enzymatic gastric lavage in 78 cases of suspected stomach carcinoma. The fasted patients were given several glasses of water the night and morning before the cytological examination. A ryles tube was passed through the mouth into the stomach and the patient was given a glass of water containing 4 mg trypsin. Gastric lavage was performed and the residual liquid was aspirated, centrifuged, and the residue stained. The results showed 16 positive and two suspected cases of malignancy out of 30 proven cases of cancer. Of the positive cases, two specimens showed signet ring shaped cells indicating an adenocarcinomatous pattern. The other specimens showed large irregular clusters of cells exhibiting nuclear and cytoplasmic abnormalities. The smears of the two cases suggestive of malignancy showed cellular atypism. There was no instance of a false positive diagnosis. The percentage of correct diagnoses obtained in this study is rather low in comparison with the findings reported in the literature.

4390 ACUTE GASTRIC DISEASE AFTER CUTANEOUS THERMAL INJURY. *(E.)* Czaja, A. J.; McAlhany, Jr., J. C.; Andes, W. A.; Pruitt, Jr., B. A. (Brooke Army Med. Cent., Fort Sam Houston, Tex.). *Arch. Surg.* 110(5):600-605, 1975.

To determine the clinical and pathologic characteristics of diffuse erosive gastritis following thermal injury, early and serial endoscopic examinations of the stomach and duodenum were performed on 54 thermally injured patients. A total of 79 examinations were performed without complications using a fiberoptic panendoscope. In addition, various blood values were measured on admission and throughout hospitalization, and gastric biopsy specimens were examined histologically. Diffuse erosive gastritis was discovered as early as 5 hr postinjury in 45 of the patients examined. Acute ulcers were identified in 14 patients and concomitant duodenal disease was present in 34. Microvascular fibrin thrombi were not present, even though five patients had disseminated intravascular coagulation. Of seven patients examined before nasogastric intubation, four with a mean burn size of 59.6% of the total body surface had diffuse gastritis. Low total serum protein levels were observed in 81% of the patients tested, but were not predictive of mucosal disease. Hemorrhage followed the clinical deterioration of six patients, and in one patient, an ulcer perforated. It is concluded that whereas coagulation abnormalities, nasogastric intubation, and hypoproteinemia may augment mucosal injury, the morphologic and histologic appearance of the lesions suggested a primary ischemic cause resulting from the opening of submucosal shunts or local vasoconstriction.

4391 INFLUENCE OF L-GLUTAMINE ON ASPIRIN-INDUCED GASTRIC LESIONS AND ABSORPTION AS WELL AS ANTIPYRETIC, ANALGESIC AND ANTI-INFLAMMATORY EFFECTS OF ASPIRIN IN RATS AND MICE. *(E.)* Tanaka, H.; Kiyohara, A.; Orima, H.; Suzuki, Y.; Takagi, K.; Okabe, S. (Pharm. Res. Lab., Kyowa Hakko Kogyo Co., Ltd., Shizuoka, Japan). *Jpn. J. Pharmacol.* 24(6): 903-910, 1974.

The effects of L-glutamine on the absorption and pharmacological actions of aspirin and on aspirin-induced gastric lesions were studied in male Wistar rats and male dd mice. Aspirin (100 mg/kg), aspirin plus L-glutamine (1000 mg/kg), or L-glutamine followed by aspirin were given p.o. to pylorus ligated and nonligated rats, some of which had previously been injected s.c. with yeast suspended in physiological saline. In some cases, a phlogistic agent was administered s.c. following aspirin and/or L-glutamine administration and foot pad swelling was measured. In other experiments, aspirin (300 mg/kg) and/or L-glutamine (1000 mg/kg) was administered to mice, which were later injected i.p. with acetic acid or aconitine. L-glutamine markedly suppressed the development of aspirin-induced gastric lesions in the pylorus-ligated rats. In the nonligated rats, aspirin was absorbed rapidly after administration and was maintained in high concentrations in the blood; L-glutamine administration had little effect on the absorption pattern. In the pylorus-ligated rats, however, aspirin administration was followed by a slow increase in the blood salicylate concentration. L-glutamine administration in these animals increased the blood salicylate level. The combined administration of aspirin and L-glutamine had little effect on the antipyretic, analgesic, or anti-inflammatory effects of aspirin in nonligated normal rats and mice. The results indicate that the effect of L-glutamine on aspirin-induced gastric lesions is not due to an inhibition of aspirin absorption and that aspirin retains its pharmacologic potential in the presence of L-glutamine. Therefore, administration of L-glutamine in combination with aspirin is recommended in clinical situations.

4392 FUNCTIONAL STOMACH DISEASE. *(Fr.)* Girard, M. (no affil.). *J. Med. Lyon* 55 (1271):863-869, 1974.

4393 THE STOMACH IN ELDERLY SUBJECTS. *(Fr.)* Roudier, M.; Bodin, F. (no affil.). *Rev. Fr. Gastroenterol.* (99):31-32, 35-36, 38, 1974.

4394 FIBRINOLYTIC ACTIVITY IN THE TISSUE, VASCULAR WALL, AND BLOOD OF PATIENTS WITH GASTRIC DISEASE: PATHOLOGICAL AND PHYSIOLOGICAL FACTORS. *(Jpn.)* Suzuki, T. (Toho Univ. Sch. Med., Japan). *Arch. Jpn. Chir.* 42(4):357-376, 1973.

4395 MASTOCYTOSIS AND URTICARIAL CHANGES IN THE GASTROINTESTINAL TRACT: ENDOSCOPY FINDINGS IN 3 CASES. *(Ger.)* Vetter, D.; Ammann, R.; Deyhle, P.; Schmid, M. (Dep. Intern. Med., Univ. Zurich, Switzerland). *Z. Gastroenterol.* 12(8):607-608, 1974.

4396 CURRENT CONCEPTS ON PHYSIOLOGICAL CONTROL OF GASTRIC ACID SECRETION. CLINICAL APPLICATIONS. *(E.)* Ivey, K. J. (R. Prince Alfred Hosp., Camperdown, Australia). *Am. J. Med.* 58(3): 389-397, 1975.

4397 PUNCTATE, TRANSENDOSCOPIC, AND PEROPERATIVE pH MEASUREMENTS WITH A RECENTLY DEVELOPED MEASURING DEVICE. *(Ger.)* Miller, G.; Maurer, W.; Trier, R.; Suter, H. R. (Solothurn Munic. Hosp., Switzerland). *Z. Gastroenterol.* 12(8):621-622, 1974.

4398 EXTRAGASTRIC GASTRIN AND GASTRIC HYPERSECRETION. *(Ger.)* Fritsch, W. P.; Hausamen, T. U.; Rick, W.; Kleybrink, H.; Schact, U. (1st Med. Clin., Univ. Dusseldorf, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:521-523, 1974.

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4401 STUDIES ON TOTAL GASTRECTOMY WITH PRESERVATION OF THE HEPATIC AND THE POSTERIOR CELIAC BRANCHES OF THE VAGUS, ESPECIALLY THE RELATION OF THE HEPATIC BRANCH TO GALLBLADDER FUNCTION AND THE POSTERIOR CELIAC BRANCH TO DUMPING SYNDROME. *(Jap.)* Wakabayashi, N. (Sch. Med., Yamaguchi Univ., Japan). *Arch. Jpn. Chir.* 42(3):211-228, 1973.

4402 NECROTIZING ENTERITIS AFTER ANTRECTOMY AND VAGOTOMY. *(Fr.)* Leger, L.; Chiche, B.; Louvel, A.; Voldman, C. (Cochin Hosp., Paris, France). *J. Chir. (Paris)* 108(4):297-306, 1974.

4403 FUNCTION OF THE CARDIA AND GASTROESOPHAGEAL REFLUX FOLLOWING DISTAL GASTRECTOMY. *(Ger.)* Siewert, R.; Koch, A.; Stuhler, T.; Jennewein, H. M. (Clin. Gen. Surg., Univ. Gottingen, Germany). *Z. Gastroenterol.* 12(8):583-590, 1974.

4404 ORAL ANABOLIC THERAPY FOR GASTRECTOMIZED PATIENTS. *(Ger.)* Bar, W.; Usbeck, W. (Med. Acad., Erfurt, Germany). *Zentralbl. Chir.* 99 (41):1306-1311, 1974.

4405 ARTIFICIAL STOMACH: PATHOPHYSIOLOGY AND SURGICAL POLICY. *(Ger.)* Winkler, R. (Surg. Clin., Univ. Hamburg-Eppendorf, Germany). *Z. Gastroenterol.* 12(6):445-452, 1974.

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4408 CRYOSURGERY AND SUBSEQUENT HEALING IN THE STOMACH AND INTESTINE. *(Ger.)* Breining, H.; Helpap, B.; Langer, S.; Lymberopoulos, S. (Med. Fac., Rhein-Westphal. Tech. Coll., Aachen, Germany). *Z. Gastroenterol.* 12(Suppl.):385-394, 1974.

4409 DECOMPRESSIVE GASTROSTOMY: OUR EXPERIENCE. *(Sp.)* Palma, F.; Luis Palomo, J. (Princess of Spain Hosp. Cent., Jaen, Spain). *Rev. Esp. Enferm. Apar. Dig.* 45(3):244-268, 1975.

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4411 USE OF ANALGESICS IN RADIOLOGY OF THE STOMACH AND DUODENUM. *(Jpn.)* Yamazaki, M.; Inakoshi, H.; Sato, T.; Higuchi, Y.; Chikaraishi, T. (Nigata Univ. Med. Sch., Japan). *Jpn. J. Clin. Radiol.* 49(5):357-370, 1974.

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4413 LIPID ISLANDS IN THE GASTRIC MUCOSA. *(Ger.)* Kraft, G.; Heilmann, K. (Munic. Hosp., Pforzheim, Germany). *Dtsch. Med. Wochenschr.* 100(3):90-97, 1975.

4414 STUDIES WITH THE HEIDELBERG CAPSULE ON AN IMPROVED GALENIC ANTACID. *(Ger.)* Medee, W.; Muller-Weiland, K. (Natl. Nerve Clin., Salzburg, Germany). *Arzneim. Forsch.* 25(1):122-123, 1975.

4415 ENDOSCOPIC STAINING OF THE STOMACH IN LIVING PATIENTS. *(Ger.)* Tschen, H. H.; Deyhle, P. (Dep. Intern. Med., Univ. Zurich, Switzerland). *Z. Gastroenterol.* 12(8):622-623, 1974.

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4417 CONSERVATIVE TREATMENT OF STOMACH PHYTOBEZOARS WITH CELLULASE. *(Ger.)* Nauer, E.; Fillippini, L. (Canton. Hosp., Lucerne, Switzerland). *Dtsch. Med. Wochenschr.* 100(6):244-246, 1975.

4418 IMPAIRED GASTRIC DIGESTION. *(Ger.)* Maiwald, L. (Med. Clin., Univ. Wurzburg, Germany). *Z. Gastroenterol.* 13(Suppl.):166-170, 1975.

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4427 THE THERAPEUTIC EFFECT AND EFFECT ON GASTROINTESTINAL FUNCTION OF METHYLMETHIONINE SULFONIUM CHLORIDE (VITAMIN U) IN THE TREATMENT OF PATIENTS WITH CHRONIC GASTRITIS. *(Rus.)* Trusov, V. V.; Oreshkov, T. M. (Izhevsk Med. Inst., USSR). *Sov. Med.* (8):121-124, 1974.

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4432 COMPARITIVE MORPHOMETRIC ANALYSIS OF CHANGES IN THE GLANDULAR APPARATUS OF THE PYLOROANTRAL PART OF THE STOMACH IN PEPTIC ULCER AND CANCER. *(Rus.)* Samsonov, V. A.; Koroleva, N. P.; Sharshavitsky, G. A. (I. P. Pavlov 1st Leningrad Med. Inst., USSR). *Arkh. Patol.* 36(9):31-35, 1974.

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See also, 3798, 3866, 4192, 4215, 4216, 4220, 4221, 4222, 4223, 4224, 4225, 4284, 4290, 4293, 4302, 4305, 4365, 4518, 4551, 4573, 4889, 5043, 5094, 5099, 5103, 5126, 5168, 5185.

STOMACH

Peptic Ulcers

4482 SERUM PYRIDOXAL IN ACTIVE PEPTIC ULCERATION. *(E.)* Sanderson, C. R.; Davis, R. E. (R. Perth Hosp., Australia). *Gut* 16(3):177-180, 1975.

Fasting serum pyridoxal was assayed by an automated microbiological system in 50 patients (24 men and 26 women, mean age 53 yr) with endoscopically confirmed peptic ulceration. Serum pyridoxal was below normal in 28 of 30 patients with gastric ulceration, one of 14 with duodenal ulceration, one of four with pyloric canal ulceration, and each of two patients with both gastric and duodenal ulceration. Mean serum pyridoxal levels in gastric ulcer and duodenal ulcer patients were 14.7 and 30.8 nM/liter, resp. Although the gastric acid group had a lower mean serum folate level compared with the duodenal ulcer group, no correlation between individual levels was found. The low serum pyridoxal level in patients with gastric ulceration and the normal level in those with duodenal ulceration could not be explained by differences in age, sex, drug use, alcohol intake, or diet. The differences may reflect differing biochemical bases between the two groups, or it may be the result of the ulceration itself.

4483 EFFECT OF METIAMIDE ON THE RESPONSE TO SECRETIN AND CHOLECYSTOKININ IN MAN. *(E.)*

Thjodleifsson, B.; Wormsley, K. G. (Dep. Ther., Univ. Dundee, Scotland). *Gut* 16(1):33-35, 1975.

The effects of i.v. metiamide on the pancreatic exocrine response to i.v. infusion of secretin (1 clinical U/kg/hr) plus cholecystokinin (CCK, 1 Ivy U/kg/hr) was studied in eight patients with duodenal ulceration. Five patients received a continuous infusion of 200 mg/hr metiamide for 1 hr; the remaining three were given a loading dose of 75 mg metiamide prior to continuous infusion of 100 mg/hr metiamide and hormones. The results of the two metiamide schedules did not differ significantly. Metiamide did not alter the secretion of bicarbonate and water. Trypsin secretion in response to secretin plus CCK decreased significantly only during the second 30 min of the 1-hr test. Metiamide virtually abolished gastric acid response to the hormones but had no consistent effect on the cholecystokinetic response. The cause of marked difference between metiamide effects on gastric and pancreatic secretion is not clear. Minimal pancreatic inhibitory effects would be expected if the secretory response to exogenous stimulants depends on interaction between stimulant and receptors and if metiamide acts by competing with gastrin (or hormone) receptors. Alternatively, no inhibitory effect of metiamide on pancreatic secretion would be expected if histamine mediates gastric secretory stimulation by exogenous stimulants but is not involved in mediating the effect of secretin and CCK on the pancreas.

4484 DUODENOGASTRIC REFLUX: A CAUSE OF GASTRIC MUCOSAL HYPERAEMIA AND SYMPTOMS AFTER OPERATIONS FOR PEPTIC ULCERATION. *(E.)*

Keighley, M. R. B.; Asquith, P.; Alexander-Williams, J. (Gen. Hosp., Birmingham, England). *Gut* 16(1):28-32, 1975.

The association between duodenogastric reflux, gastritis, and symptoms was investigated in 30 patients with or without dyspepsia 1-15 yr after gastric ulcer surgery. Patients with biliary disease, hiatus hernia, or recurrent ulceration were excluded from the study. The 30 patients (25 men and five women, mean age 42 yr) were assessed by a symptomatic score, measurement of bilirubin and sodium concentrations in fasting gastric juice, gastric biopsy, and the presence of radiological reflux. In 15 patients with a symptom score of less than median, gastric bilirubin levels were less than 1 mg/ml in 80%; severe endoscopic changes were seen in only one patient and reflux was not observed. Of the 15 patients with a symptom score in excess of the median, 12 had a bilirubin concentration greater than 1 mg/100 ml and four of these had a level in excess of 4 mg/100 ml. Radiological reflux was present in 60% of this group and severe mucosal hyperemia in 50%. There was a significant correlation between symptoms, gastric hyperemia, and duodenal reflux ($P<0.02$). Symptoms closely correlated with duodenal reflux included bile vomiting, nausea, epigastric pain after meals, bile regurgitation, heartburn, and fatty intolerance. Further gastric surgery other than a biliary diversion is likely to aggrevate rather than improve the symptoms.

4485 THE NATURAL HISTORY OF GASTRIC ULCER IN A COMMUNITY: A FOUR-YEAR STUDY. *(E.)*

Mowat, N. A. G.; Needham, C. D.; Brunt, P. W. (Dep. Med., Univ. Aberdeen, Scotland). *Q. J. Med.* 44(173): 45-56, 1975.

All (151) adult patients in northeast Scotland with supposedly benign gastric ulcer first diagnosed in 1967 were studied after a minimum of 4 yr, with a 98% follow-up. The incidence and male:female ratio both increased with advancing age. Ulcers of the body of the stomach were twice as common as ulcers of the antral region. Major coincidental disease (largely cardiovascular, respiratory, or locomotor) was present in 59% of the patients and was the principal cause of 25 of the 29 deaths in the series. Twenty-one patients presented with bleeding but only one other bled subsequently; one patient presented with perforation of gastric ulcer; and two ulcers proved to be malignant. Neither presentation nor course was significantly affected by associated duodenal ulceration (33% of cases). There was a direct correlation between short duration of symptoms and increasing age and mortality. Forty-four (55%) of 82 medically treated patients and 41 (60%) of 69 surgically treated patients were alive and symptom-free at the end of the follow-up period; the respective mortalities were 18.2% and 20.3%. For the whole series, life expectancy was significantly reduced in females (15 deaths *versus* 6.03 expected), but not in males.

4486 CHOLINERGIC STIMULATION OF THE LOWER ESOPHAGEAL SPHINCTER IN PATIENTS WITH VAGOTOMY AND ANTRECTOMY. *(E.)*

Higgs, R. H.; Castell, D. O. (US Nav. Hosp., Philadelphia, Pa.). *Am. J. Dig. Dis.* 20(3):195-200, 1975.

The effect of bethanechol on lower esophageal sphincter (LES) pressure was determined in 10 vagotomized and antrectomized patients (eight men and two women, mean age 45 yr). Both s.c. (0.08 mg/kg) and p.o. (25 mg) administration of bethanechol caused a significant increase in LES pressure in these patients. Sphincter pressure in patients who received the drug s.c. increased from a mean basal level of 16.5 to 41.2 mm Hg at 25 min. Hypotensive basal LES pressure in four patients rose from 8.0 to 41.0 mm Hg. In the six patients given bethanechol p.o., sphincter pressure increased from 11.2 to 19.1 mm

Hg at 75 min. Three of these patients had hypotensive sphincter pressure plus symptomatic gastroesophageal reflux and endoscopic evidence of esophagitis. Following p.o. bethanechol, sphincter pressure rose from 8.0 to 18.3 mm Hg. P.o. administered bethanechol produced a sustained increase in LES pressure throughout a 90-min study period. These studies suggest that cholinergic stimulation of the LES with bethanechol may be of therapeutic benefit in vagotomized and antrectomized patients with gastroesophageal reflux.

4487 DISPERSION ANALYSIS OF PROGNOSTIC AND RELAPSING FACTORS OF DUODENAL ULCER BY USE OF ELECTRON COMPUTER.

(E.) Kawai, K.; Kohli, Y. (Kyoto Prefect. Univ. Med., Japan). *Am. J. Gastroenterol.* 63(1):20-28, 1975.

Complete healing of duodenal ulcers and ulcer scars was documented endoscopically in 109 of 192 patients (92.2% male) studied over a 3-yr period. The 192 cases included 91 with a single duodenal ulcer, 57 with kissing ulcers, and three with multiple ulcers. The shape of single ulcers was round in 49 cases, irregular in 24, long linear in 10, and short linear in eight. After healing, ulcers recurred in 25 cases. Computer analysis of morphologic data showed that linear ulcers were more intractable to healing than round or irregularly shaped ulcers. Increased age was associated with an increased incidence of linear ulcers and a decreased incidence of round ulcers. Ulcers with a marginal swelling appeared to heal more readily than those without it. Number, distribution of lesions, and degree of radiological deformity of the duodenal cap were of no prognostic value. However, kissing ulcers and scars with redness or convergency of mucosal folds showed a tendency to recur. Endoscopy was more useful than radiological examination in description of location, number, shape, and/or stage of duodenal ulcers.

4488 pH DEPENDENCE OF ACID SECRETION AND GASTRIN RELEASE IN NORMAL AND ULCER SUBJECTS.

(E.) Walsh, J. H.; Richardson, C. T.; Fordtran, J. S. (Dep. Med., Univ. California, Los Angeles). *J. Clin. Invest.* 55:462-468, 1975.

Studies were performed on normal subjects and duodenal ulcer patients to assess the effect of gastric acid concentration on the rate of gastric acid secretion and endogenous gastrin release in response to an amino acid or a steak meal. The rate of gastric acid secretion was estimated by measuring the rate of sodium bicarbonate infusion needed to keep intragastric pH constant. Preliminary studies on five normal subjects showed that the secretion rate with an intragastrically instilled amino acid-cornstarch meal was highest at pH 5.5 and was 60% of that produced by a steak meal at the same pH. Progressive lowering of intragastric pH was associated with a stepwise reduction in acid secretion, with secretion at pH 2.5 only half as great as at pH 5.5. The amino acid meal produced increases in serum gastrin that were also less marked than those produced by a steak meal. Increase in serum gastrin over basal concentrations was similar at pH 5.5, 4.0, and 3.0; a measurable increase was not obtained when the meal was maintained at pH 2.5. Six patients with duodenal ulcers (three men and three women, mean age 46.5 yr) were compared with seven normal subjects (three women and four men, mean aged 31.4 yr) at pH 5.5 and 2.5. At both pH values, ulcer patients secreted more acid throughout the 2-hr period following instillation of amino acid meal than did the normal subjects. More important, the degree of inhibition at pH 2.5 was significantly less in ulcer patients. During the second postprandial hr at pH 2.5, acid secretion was suppressed 70% in the controls and only 30% in the patients. These findings suggest a defect in autoregulation of gastrin release and gastric acid secretion at low pH in ulcer patients which may play a role in the pathogenesis of this disease.

4489 ULTRA-STRUCTURAL CHANGES IN THE SMOOTH MUSCULATURE OF ANTRUM AND PYLORUS IN PRESENCE OF ULCUS VENTRICULI.

(E.) van der Zypen, E. (Inst. Anat., Univ. Basel, Switzerland). *Res. Exp. Med. (Berl.)* 164(1):1-17, 1974.

The smooth musculature of the antrum and pylorus of seven patients with one or more stomach ulcers was examined by transmission electron microscopy. The corresponding regions from five normal organ donors served as control material. Electron microscopically visualizable changes were found at distances of up to 180 mm from the site of ulcerous lesions on the smooth muscle cells of the inner and outer longitudinal musculature, and on blood vessels. In the majority of cases, condensation of sarcoplasmic ground substance and myofilaments was observed in combination with distention of hypolemmal vesicles and proliferation of dense bodies. These changes are interpreted as an expression of a pronounced isometric contraction of smooth musculature in the presence of ulcera ventriculi: following glutaraldehyde fixation, the normal stomachs were invariably in a state of relaxation, whereas stomachs with ulceration were partially in a state of isometric contraction. Other changes observed in the presence of stomach ulcer were swelling of the endoplasmic reticulum of smooth muscle cells, lysis of myofilaments, and lacunae. Vacuolization of the endoplasmic cisternae caused displacement of other cell organelles and of the myofilaments. The swelling of the endoplasmic spaces and lysis of the myofilaments indicate degeneration of the muscle cells. The capillary endothelial cells showed degenerative changes that lead to arrest of cytopemtpic processes. In the arteriolar regions, a strong contraction of the smooth musculature frequently resulted in complete occlusion of the vascular lumen. Though further systematic studies are needed, these findings substantiate light microscopy observations on the antral and pyloric musculature in the presence of stomach ulcer.

4490 FAILURE OF SECRETIN RELEASE IN PATIENTS WITH DUODENAL ULCER.

(E.) Bloom, S. R.; Ward, A. S. (Middlesex Hosp., London, England). *Br. Med. J.* 1(5950):126-127, 1975.

Secretin release was studied in 23 patients with duodenal ulcer (21 men and 2 women, mean age 42 yr) and 12 normal subjects (10 men and 2 women, mean age 38 yr). I.v. infusion of pentagastrin (6 μg/kg/hr) produced a plateau of gastric acid secretion that was significantly higher in the duodenal ulcer patients than in the normal subjects. Intraduodenal infusion of 40 ml of 0.1 M HCl resulted in a similar absolute fall in acid output in the two groups, but the rise in plasma secretin levels after intraduodenal acid infusion was significantly higher in controls than in duodenal ulcer patients (52.6 ng/liter *versus* 37.5 ng/liter at 6 min). Patients with symptoms of duodenal ulcer for less than 10 yr and those with a history over 10 yr had a very similar 10-min secretin release (274 and 273 ng/liter/min, resp.). The nine duodenal ulcer patients who smoked 20 or more cigarettes a day had a particularly reduced secretin release compared with that of patients who smoked less than 15 cigarettes a day (216 *versus* 312 ng/liter/min). No correlation was apparent between the amount of secretin released by intraduodenal acid and either the degree of gastric inhibition or the level of the initial gastric acid plateau. These results demonstrate that patients with a duodenal ulcer have an impaired secretin release in spite of requiring greater pancreatic bicarbonate output to neutralize a larger gastric acid load.

4491 THE EFFECT OF AN H_2-RECEPTOR ANTAGONIST ON FOOD-STIMULATED ACID SECRETION, SERUM GASTRIN, AND GASTRIC EMPTYING IN PATIENTS WITH DUODENAL ULCERS: COMPARISON WITH AN ANTICHOLINERGIC DRUG. *(E.)* Richardson, C. T.; Bailey, B. A.; Walsh, J. H.; Fordtran, J. S. (Univ. Texas Health Sci. Cent., Dallas). *J. Clin. Invest.* 55:536-542, 1975.

The effects of isopropamide (an anticholinergic drug) and metiamide (an H_2-receptor antagonist) on food-stimulated acid secretion were compared. Seven duodenal ulcer patients (two women and five men, mean age 41.7 yr) were stimulated by a steak meal, and acid secretion was measured by *in vivo* intragastric titration. A maximum tolerated p.o. dose of isopropamide (20-40 mg/dose) inhibited food-stimulated acid secretion by a maximum of 35%. In contrast, a 400-mg dose of p.o. metiamide produced no side effects and inhibited secretion by 96%. A maximum tolerated dose of isopropamide and 300 mg metiamide suppressed food-stimulated acid secretion to a greater extent than 400 mg metiamide alone (88 mEq reduction *versus* 63 mEq). Neither isopropamide nor metiamide affected serum gastrin concentration or gastric emptying. If given before meals, metiamide was most effective during the early posprandial period, whereas if given after meals, it was most effective during the second hr after eating. The duration of action was at least 3 hr. These results indicate that histamine has a dominant role in mediating food-stimulated acid secretion and that the specific inhibitory effect of metiamide on acid secretion is not mediated through inhibition of gastrin release.

4492 THE EFFECT OF HISTAMINE ON GASTRIC SECRETION IN PATIENTS WITH PEPTIC ULCER. *(Rus.)* Voinova, M. Kh.; Kliminskii, I. V. (2nd Moscow Med Inst., USSR). *Khirurgiia (Mosk.)* (4):58-62, 1974.

Studies were carried out on gastric acid secretion and the histamine content of the gastric juice, blood and tissues of 24 males with peptic ulcer (18 had ulcers in the duodenum, 6 in the stomach). Six healthy adults served as the controls. Tests were made to determine the basal acid output (BAO) and maximal acid output (MAO) after stimulation with exogenous histamine (0.04 μg/kg). In patients with duodenal ulcer, the histamine content in the blood did not differ significantly from that of the controls, while excessive acid secretion was observed in the stomach: BAO 6.25±0.81 mEq/hr and MAO 37.22±0.64 mEq/hr (in healthy adults: 2.1±0.64 and 10.5±3.0 mEq/hr, resp.). Basal histamine secretion with the gastric juice averaged 132.8±27.8 μg/hr and in stimulated secretion, 160.23±6.4 μg/hr. Drug-induced (benzohexonium and atropine) and surgical vagotomy significantly decreased histamine secretion and the histamine content in the gastric juice. A correlation was found between acid and histamine content in the gastric juice in patients with stomach ulcer. It is suggested that histamine content in the gastric juice in patients with duodenal ulcer is closely related to the tonus of the vagus nerve.

4493 CERTAIN PROBLEMS OF HEREDITY ASSOCIATED WITH PEPTIC ULCER. *(Rus.)* Frolkis, A. V.; Somova, E. P. (Petrozavodsk University, USSR). *Klin. Med. (Mosk.)* 52(8):120-124, 1974.

Family studies of 124 peptic ulcer patients showed that in 35 (28.2%) families relatives of the propositi had a prior history of the disease. Adverse family histories (peptic ulcer, gastritis, epigastric pain, intestinal cancer) among the patients' families was 5.5 times greater than among the families of 124 controls with no gastrointestinal disease (52.4% and 9.6%, resp.). There were significantly more peptic ulcer patients with the O(I) blood group and among the nonsecretors of A, B and AB antigens. Starch gel electrophoretic studies of serum alkaline phosphatase isoenzymes from peptic ulcer patients showed that the slow-moving B component was absent in 58% of the patients, mostly those with the A(II) blood group. Serum pseudocholinesterase in peptic ulcer patients was significantly lower than in healthy controls (0.46±0.016 and 0.58±0.021 U, resp.). Further electrophoretic studies showed that fraction 3 of cholinesterase was missing in 35.5% of the patients, mostly those with the A(II) blood group. These findings confirm that there are 2 types of peptic ulcer: one related to the genetic factors (patients with the O(I) blood group, nonsecretors with certain types of alkaline phosphatase and pseudocholinesterase and another associated with phenotype.

4494 PERSISTENT INHIBITION OF GASTRIC SECRETION BY AN INTRAVENOUS 12-HOUR INFUSION OF CALCITONIN IN NORMALS, PEPTIC ULCER AND HIGH RISK PATIENTS. *(E.)* Hotz, J.; Goebell, H.; Minne, H.;

Ziegler, R. (Cent. Intern. Med. Pediatr., Univ. Ulm, Germany). *Digestion* 11(3/4):311-314, 1974.

The effect of a 12-hr infusion of thyrocalcitonin (20-60 MRC U/hr) on unstimulated acid and pepsin secretion was studied in 4 healthy volunteers, 3 peptic ulcer patients and 3 high risk patients. The high-risk patients suffered from cerebral ischemic syndrome, pulmonary decompensation, and subarachnodial hemorrhage, resp. A striking reduction of total acid output took place in 3 normal subjects and in 2 peptic ulcer patients compared with control experiments. All high-risk patients showed a marked suppression of acidity during and after thyrocalcitonin infusion (40 MRC U/hr). Pepsin secretion paralleled acid output in all cases. In 4/7 cases, side effects (slight nausea and transient headache) occurred. The results suggest that the therapeutic application of thyrocalcitonin by an i.v. route may be restricted to selected cases.

4495 RESULTS OF STIMULATION OF THE STOMACH WITH HISTALOG IN 32 NEGROES WITH CHRONIC DUODENAL ULCER.

(E.) Lutete-Kelani, M. (Clin. Intern. Dis., Natl. Univ. Lubumbashi, Zire). *Mater. Med. Pol.* 6(2):136-139, 1974.

Gastric secretion after betazole was studied in Africans suffering from duodenal ulcer, and the values were compared with normal values from Europeans. Basal and betazole-stimulated (2 mg/kg, s.c.) gastric secretion was collected in 15-min portions during 90 min from 32 patients (26 men and 6 women) with chronic duodenal ulcer. Basal gastric secretion (2.45 ± 2.3 mEg/liter in men and 0.69 in women) did not exceed the normal values for Europeans. Gastric secretion stimulated with betazole in the same group of patients (17 ± 10.91 mEg/liter in men and 8.6 in women) was within normal values. The data suggest that hypersecretion of gastric juice is not an essential factor in the pathogenesis of duodenal ulcer in black Africans.

4496 EFFECTS OF AN ANTIULCER AGENT, N-ACETYL-L-GLUTAMINE ALUMINUM COMPLEX (KW-110) ON THE DUODENAL AND GASTRIC ULCER MODELS IN THE RAT.

(E.) Takagi, K.; Takeuchi, K.; Nakamura, K.; Morita, A.; Okabe, S. (Fac. Pharm. Sci., Univ. Tokyo, Japan). *Jpn. J. Pharmacol.* 24(3):357-361, 1974.

The effects of N-acetyl-L-glutamine aluminum complex (KW-110) and atropine sulfate on duodenal and gastric ulcers were compared in studies on male Donryu rats. KW-110 (p.o. for 8 days) significantly accelerated the healing of duodenal ulcers at 1000 mg/kg/day (38.0%) or 3000 mg/kg/day (40.0%). The effect of atropine sulfate (20 mg/kg/day for 8 days, s.c.) was not significant. Although atropine sulfate (10 mg/kg) completely inhibited stress ulcer formation, KW-110 was also strongly inhibitory at 500 mg/kg (66.0%) or 1000 mg/kg (81.7%). At 500 and 1000 mg/kg, KW-110 inhibited Shay ulceration by 44.3% and 100%, resp., and aspirin-induced lesions by 32.8% and 69.1%, resp. At 10 mg/kg, atropine sulfate inhibited Shay ulceration and aspirin-induced lesions by 74.4% and 33.8%, resp. Prevention of Shay ulceration by KW-110 appeared to be caused by raised pH value and reduced pepsin activity. These results confirm that KW-110 is a promising antiulcer agent in experimental gastrointestinal ulcer models.

4497 CONTROLLED STUDY OF THE SURGICAL TREATMENT OF DUODENAL ULCER.

(E.) Dwight, R. W.; Schimmel, E. M.; O'Hara, E. T.; Hechtman, H. B.; Williams, L. F.; Vollman, R. W.; Maselli, J. P.; Johnson, W. C.; Nabseth, D. C. (Boston VA Hosp., Mass.). *Am. J. Surg.* 129(4):374-379, 1975.

Vagotomy and drainage was compared with vagotomy and hemigastrectomy in treatment of duodenal ulcer. Of 100 male veterans, 51 were selected for hemigastrectomies and 49 for drainage procedures on a random basis. Of the hemigastrectomies, 18 were Billroth I and 33 Billroth II operations; of the drainage procedures 28 were Heinke-Mikulicz, 5 Jaboulay, 8 Finney, 2 Wagensteen pyloroplasties, and 6 posterior gastroenterostomies. Both patient groups were comparable in age, duration of symptoms, and preoperative peak acid output. Every 3 months in the 1st yr after surgery, and then every 6 months, each patient was weighed and given a questionnaire about work, bowel and eating habits, symptoms, and use of medication. The abdomen was examined for tenderness, succussion, solidity of the scar; blood was tested for serum iron, iron-binding capacity, and hematocrit; and stools were given a guaiac test. Surgical results were considered excellent when patient had no complaints; good when there were mild symptoms; and poor when symptoms were marked enough to affect the patient's way of life; and a failure when ulcer recurred, reoperation was necessary, or incapacitating dumping and malnutrition occurred. Follow-up was 5 yr or more in 52 patients, 3 yr in 80, and at least 1 yr in the remainder, excluding 3 who were not followed up. Operating time was significantly longer for hemigastrectomy (245 min) than for drainage (170 min) and transfusion was required in 15 of the former and 4 of the latter. Six major complications and five minor ones occurred after resection, while 2 major and 8 minor complications occurred after drainage. After resection, results were excellent in 45%, good in 35%, poor in 9% and failure in 8%. After drainage, the corresponding results were 58%, 25%, 8%, and 8%, resp. Failures after resection included 2 recurrent ulcers, 1 reoperation for stomal obstruction, and 1 case of severe dumping and malnutrition. Failures after drainage included 3 recurrent ulcers, 1 reoperation for pyloric obstruction. The type of drainage procedure or anastomosis used did not affect the results. Blood tests showed no significant differences between the two groups. Mean weight loss was significantly greater after resection (17.5 pounds) than drainage (10.5 pounds). It is concluded that there is no significant difference on mortality or recurrence of ulcers between vagotomy and resection and vagotomy and drainage; however, as nutrition is maintained better after drainage, this procedure is recommended.

4498 GASTRO-DUODENAL ULCER IN KIDNEY-TRANSPLANTED PATIENTS RECEIVING IMMUNOSUPPRESSIVE TREATMENT. *(E.)* Rasmussen, K.; Christiansen, J.; Nielsen, O. V.; McNair, A.; Sorenson, M. B. (Glostrup Hosp., Denmark). *Acta Chir. Scan.* 141(1):61-64, 1975.

The clinical course was evaluated in 14 cases of gastroduodenal ulcer in kidney-transplanted patients receiving immunosuppressive therapy. Of 229 patients who received kidney transplants in the Copenhagen hospitals between 1968 and 1973, 14 had or developed peptic ulcers requiring treatment in connection with the transplantation. In three patients a prophylactic gastric operation was carried out prior to the kidney transplantation; in two with ulcer dyspepsia during the uremic period, conservative treatment with antacids and controlled diet was given prior to transplantation; conservative treatment was also given in three cases of peptic ulcer complications during immunosuppressive treatment; and surgery was performed in five patients with peptic ulcer complications during immunosuppressive treatment. Among the eight patients in whom bleeding peptic ulcer occurred during immunosuppressive therapy, six died due to hemmorrhage. Five were operated acutely, three of whom died. In three in whom the ulcer was neither removed nor excluded, hemmorrhage from the same ulcer recurred during immunosuppressive treatment. Of the patients treated with prophylactic surgery prior to kidney transplantation, only one showed symptons of transient dyspepsia during immunosuppressive therapy. The results indicate that a verified peptic ulcer occurring prior to transplantation should be subjected to prophylactic surgery. In the case of ulcer dyspepsia arising during immunosuppressive treatment, the treatment should be elective surgery and discontinuation of the immunosuppressive drugs during the healing period. Radiological examination of the stomach and esophagogastroduodenoscopy should be a standard procedure prior to kidney transplantation.

4499 EFFECT OF ATROPINE ON GASTRIC SECRETION OF ACID, PEPSIN, AND ELECTROLYTES ELICITED BY MAXIMAL STIMULATION WITH HISTAMINE AND PENTAGASTRIN IN NORMAL CONTROL AND DUODENAL ULCER PATIENTS FROM BOMBAY. *(E.)* Pimparkar, B. D.; Bhiwankar, N. T.; Kulharni, B. S.; Mehta, J. M. (K. E. M. Hosp., Bombay, India). *Indian J. Med. Res.* 62(11):1736-1750, 1974.

To determine whether gastric acid secretion stimulated by augmented doses of histamine and pentagastrin could be suppressed by atropine, an augmented histamine test (76 μg/kg histamine acid phosphate) and a pentagastrin test (6 μg/kg) were carried out in 10 normal controls and 15 patients with duodenal ulcer. Atropine (1.2 mg) was given twice, once during the basal period and again after stimulation with histamine and pentagastrin. In both controls and patients, atropine significantly suppressed basal and stimulated acid secretion. During the basal period and after stimulation with histamine or pentagastrin, atropine resulted in identical suppression in gastric pepsin, sodium, potassium, and chloride in both groups. With atropine there was significant suppression in volume but no significant changes in the concentration of acid pepsin and electrolytes. It is concluded that histamine and pentagastrin act through the vagus since their action after augmented doses is suppressed by atropine. The predominant action of atropine is a decrease in gastric secretory volume which reflexly limits the output of various ingredients, even though there is no significant change in their concentrations.

4500 STUDIES ON THE HEALING OF EXPERIMENTAL ULCER IN THE RAT II: INFLUENCE OF ANTI-INFLAMMATORY DRUGS ON THE HEALING OF THE ACETIC ACID ULCER AND THE COMPONENTS IN GASTRIC TISSUE. *(E.)* Takagi, K.; Abe, Y. (Fac. Pharm. Sci., Univ. Tokyo, Japan). *Jpn. J. Pharmacol.* 24(3):345-356, 1974.

The relation between chemical components of an acetic acid ulcer site and ulcer healing was investigated in male Donryu rats together with the effects of antiinflammatory drugs on the ulcer. The hexosamine content in the corpus of normal rat stomach decreased when sodium salicylate (0.5%) or phenylbutazone (0.2%) was added to the diet for 20 days. Both sodium salicylate and phenylbutazone delayed the healing of 10% acetic acid ulcer, and resulted in a simultaneous decrease in hexosamine at the ulcer site. Prednisolone (25 mg/kg s.c.) and cortisone (50 mg/kg s.c.) retarded ulcer healing in the early stages of administration, when hexosamine and hydroxyproline decreased significantly. Sodium salicylate, by contrast, delayed ulcer healing in the early and also later stages of administration. A decrease in hexosamine content in the injured mucosa and a decrease in hydroxyproline content in the injured stroma paralleled an increase of area index and grade index, resp. These results suggest that the mucosal hexosamine and stromal hydroxyproline content in the injured portion play an important role in ulcer healing. The data also demonstrate differences between steroidal and nonsteroidal anti-inflammatory agents with respect to retardation of ulcer healing.

4501 CYSTEAMINE-INDUCED DUODENAL ULCERS: A NEW MODEL TO TEST ANTIULCER AGENTS. *(E.)* Robert, A.; Nezamis, J. E.; Lancaster, C.; Badalamenti, J. N. (Upjohn Co., Kalamazoo, Mich.). *Digestion* 11(3/4):199-214, 1974.

The effect of various agents on cysteamine-induced ulcers and the effect of cysteamine on gastric secretion were studied in Upjohn rats to evaluate the procedure as an assay for antiulcer agents. Cysteamine was administered at doses 230-465 mg/kg, s.c. and 460-900 mg/kg, p.o.; the duodeno-ulcerogenic property of cysteamine was dose-dependent after either route of administration. Duodenal ulcers were produced within 24 hr; at least 50% of the ulcers perforated with 425 mg/kg, s.c. Cysteamine-induced duodenal ulcers were prevented by an anticholinergic agent (methscopolamine bromide), by an antacid (Malcogel) by prostaglandins (PGE_2 and 16,16-dimethyl PGE_2), by prednisolone, and by interruption of the gastroduodenal transit (pylorus ligation). Fasting did not affect the incidence but reduced the severity of the ulcers. Incidence and severity were higher in female than in male rats. Deoxycorticosterone and ACTH did not affect the ulcers. Gastric secretion was inhibited by cysteamine and was dose-dependent; however, some acid secretion and the passage of acid gastric contents over the duodenum were required for cysteamine to produce ulcers. The results indicate that cysteamine-induced duodenal ulcers provide an excellent model for the study of antiulcer agents.

4502 EFFECT OF METIAMIDE ON HISTAMINE METABOLISM IN MAN. *(E.)* Shepherd, D. M.; Thjodleifsson, B.; Turnbull, M. J.; Wormsley, K. G. (Dep. Pharmacol. Ther., Univ. Dundee, Scotland). *Digestion* 11(3/4):307-310, 1974.

The effect of metiamide on the urinary excretion of histamine, 1,4-methylhistamine, and 5-hydroxyindol-3-yl-acetic acid was studied in 12 duodenal ulcer patients (aged 22-65 yr) receiving metiamide therapy (600-1200 mg/day). Administration of metiamide resulted in an increased excretion of 1,4-methylhistamine (263 to 465 µg/24 hr) and a decreased secretion of histamine (29.5 to 19 µg/24 hr). The excretion of 5-hydroxyindol-3-yl-acetic acid was not significantly affected. Blood metiamide levels were 1 to 6 x 10^{-6}M and the urinary amine excretion pattern was compatible with an *in vivo* stimulation of histamine methyltransferase (HMT) activity. If histamine is involved in mediating the gastric secretory response to stimulants in man, then the stimulation of HTM activity by metiamide may contribute to the inhibition of gastric secretion produced by the drug.

4503 GLYCOPROTEINS IN THE STOMACH OF PATIENTS WITH GASTRIC AND DUODENAL ULCERS: PATHOPHYSIOLOGICAL FINDINGS AND EFFECT OF TREATMENT. *(Cz.)* Domschke, W.; Demling, L. (Clin. Intern. Med., Univ. Erlangen-Nuremberg, Erlangen, Germany). *Vnitr. Lek.* 20(7):625-630, 1974.

The rate of gastric acid secretion was measured before and for 1.5 hr after pentagastrin infusion (1.5 g/kg/hr i.v.), as was the output of glycoproteins containing *N*-acetylneuraminic acid (NANA), in 22 patients with gastric ulcers, 20 with duodenal ulcers, and in 45 normal controls. These studies were performed on patients before and 4 weeks after carbenoxalone treatment. Patients with gastric ulcers were given 300 mg/day carbenoxalone sodium for 1 week and then 150 mg/day, while patients with duodenal ulcers received 300 mg/day of the enteric-coated form of the drug. In normal subjects there was a very good linear relation between the peak acid output and the production of glycoproteins containing NANA. This relation was also evident in patients with gastric ulcers, but the rate of HCl production was greater than in controls. No such relation was found between these two parameters in patients with duodenal ulcers. After 4 weeks of treatment with carbenoxalone sodium, the output of glycoproteins containing NANA increased significantly and even exceeded normal values in patients with gastric ulcers. However, carbenoxalone sodium did not stimulate mucus production in the stomach of patients with duodenal ulcers since the drug was not absorbed until after it had passed through the stomach.

4504 CALCULATED MAXIMAL RESPONSE AND ED_{50} FOR ACID SECRETION IN CONTROL SUBJECTS AND PATIENTS WITH DUODENAL ULCER. *(E.)* Desai, H. G.; Zaveri, M. P.; Antia, F. P. (B. Y. L. Nair Charitable Hosp., Bombay, India). *Indian J. Med. Res.* 62(12):1843-1849, 1974.

Values of calculated maximal response (CMR) and ED_{50} on i.v. histamine tests were determined in 13 control subjects in India and 20 male patients with duodenal ulcer. Dose-response curves were obtained using 0.4-2.8 mg/kg doses of histamine acid phosphate. The mean ED_{50} value was lower in ulcer patients (9.7 ± 5.3 µg/kg/hr) than in controls (12.5 ± 5.3), but the difference was not significant. CMR values in controls (8.0 ± 2.3 mEq/155 min) and in patients (10.1 ± 3.1) were significantly different, as were the highest observed values (HOV) of acid output (6.3 ± 1.5 mEq/15 min in controls and 8.5 ± 2.7 in patients). However, the lowest HOV value (2.5 mEq/15 min and the lowest CMR value (3.5 mEq/15 min) were observed in duodenal ulcer patients. The value of ED_{50} in relation to body weight showed a significant correlation with the body weight of controls but not of ulcer patients. The ED_{50} vlaues obtained in this study differ from those reported for North American patients with duodenal ulcer; the difference may result from marked differences in maximal acid output in the patients from these countries.

4505 SECRETION OF GASTRIC LIPASE, PEPSIN AND HYDROGEN IONS FOLLOWING PENTAGASTRIN ADMINISTRATION IN PATIENTS WITH DUODENAL ULCER. *(Pol.)* Trompeter, G.; Komarowska, M.; Szafran, Z.; Popiela, T. (Med. Acad., Krakow, Poland). *Przegl. Lek.* 31(2): 287-293, 1974.

Pentagastrin was administered for 3 hr by continuous i.v. infusion to six male patients (aged 20-43 yr) with duodenal ulcer. The dose was increased every 30 min (8, 64, 256, 1024, 2048, and 8192 ng/kg), gastric juice collected every 10 min and hydrogen ion concentration as well as lipase and pepsin activity determined in each of the 18 fractions. In fasting gastric juice the hydrogen ion concentration varied between 10-61 mEq/liter, activity of lipase between 0.67-4.61 U/min/ml, of pepsin 0.18-0.56 x 10^{-2} Anson U/min/ml. Highest lipase activity was obtained in fraction collected after 140-150 min, the highest pepsin activity 70-80 min, highest ion concentration 130-140 min of test. Despite a great variation in values, statistical analysis revealed a highly significant positive correlation between all three measured parameters. The most significant correlation coefficient was obtained between hydrogen ion concentration and lipase activity. In calculations taking into account the output values a high correlation coefficient was obtained for output of both enzymes. It is concluded that pentagastrin stimulation caused active secretion not only of pepsin and hydrogen ions but also of gastric lipase.

4506 STUDIES ON THE BIOELECTRICAL ACTIVITY OF THE STOMACH IN PEPTIC ULCER. *(Pol.)* Wryzykowski, R.; Szczgiel, B.; Rucinski, J. (Med. Acad., Warsaw, Poland). *Przegl. Lek.* 31(2):283-286, 1974.

External electrography using the EMA electrogastrograph Model EGS-4M was performed on 21 healthy volunteers, 10 patients with gastric, 14 with duodenal ulcer and six with narrowing of the pylorus. The tests were performed after overnight fasting and in the control group also after food, atropine or prostygmine stimulation. The time of recordings varied between 10-60 min. The electrogastrograms were interpreted by calculating the average frequency of biopotential changes/min and average amplitude in mV. It was found that in comparison to controls (average frequency/min = 3.5, average ampliture/mV = 0.3) the basal electrical rhythm was decreased in patients with gastric ulcer in regard to average frequency (1.1) and average amplitude (0.1); increased in regard to average frequency (4.5) without change in amplitude in patients with duodenal ulcer, while in patients with narrowing of the pylorus and ulcer a significant increase in amplitude (0.8) without change in frequency was observed. Both frequency and amplitude increased. Atropine (0.5 mg) caused a decrease in amplitude and slowing down of frequency. Prostigmin caused a significant increase in the bioelectric activity of the stomach both in regard to amplitude and frequency.

4507 EFFECT OF CALCIUM AND HISTAMINE ON GASTRIC ACID SECRETION IN MAN. *(E.)* Dalal, N. J.; Vakil, B. J.; Gangrade, R. R.; Bhise, K. B.; Shah, P. N. (J. J. Group Hosp., Bombay, India). *Indian J. Med. Res.* 62(11):1652-1658, 1974.

Gastric acid secretion in response to calcium infusion and subsequent histamine injection was studied in seven Indian patients with duodenal ulcer, six patients with hyperacidity, and seven normal subjects. Calcium infusion (4 mg/kg/hr, i.v., for 3 hr) resulted in a significant rise in gastric acid secretion over basal values; the calcium-stimulated maximum acid output was 2.19 times the basal output in controls, 2.23 times the basal output in duodenal ulcer cases, and 2.84 times the basal output in hyperacidity cases. Histamine administration (0.04 mg/kg s.c.) induced a further rise in acid secretion. Maximum acid secretion after calcium infusion was 63% and 55%, resp., of post-histamine values in patients with duodenal ulcer and those with hyperacidity; in controls the post-calcium value was 41% of the post-histamine value. The difference in the response between controls and the duodenal ulcer and hyperacidity cases was significant, whereas the difference in the response between the two groups of patients was not significant. To determine if there is any potentiation between calcium and histamine, four controls were infused with histamine (0.04 mg/kg/hr) until a steady state of gastric acid secretion was reached; calcium was then given simultaneously with histamine for 2 1/2 hr. No further increase in gastric acid secretion occurred in response to the calcium infusion. The absence of potentiation between histamine and calcium indicates that calcium provides a submaximal stimulus for acid secretion compared with histamine.

4508 HIGHLY SELECTIVE VAGOTOMY FOR DUODENAL ULCER: DO HYPERSECRETORS NEED ANTRECTOMY? *(E.)* Johnston, D.; Pickford, I. R.; Walker, B. E.; Goligher, J. C. (Gen. Infirm., Leeds, England). *Br. Med. J.* 1(5960):716-718, 1975.

Patients who had undergone highly selective vagotomy for duodenal ulcer were reviewed 2-6 yr later to determine if the surgical treatment was adequate or if antrectomy was also needed in hypersecretors. The clinical results in 40 hypersecretors were compared with those in 60 patients with normal acid secretion. The overall clinical results were similar in both groups; the incidence of pain of ulcer type was 6% in each group, peak acid output was similar in both groups, and the incidence of incomplete vagotomy was 7% in each group. In no case was a recurrent ulcer seen. The incidence of individual symptoms was about equal in the two groups, however early dumping was recorded in 1% of hypersecretors compared with 6% of normal secretors. The results suggest that the addition of antrectomy to vagotomy is unnecessary when patients with hypersecretion are treated by highly selective vagotomy, providing the vagotomy is complete.

4509 MARGINAL ULCER IN ACHLORHYDRIC PATIENTS. *(E.)* Tauxe, R. V.; Wright, L. F.; Hirschowitz, B. I. (Dep. Med., Univ. Alabama, Birmingham). *Ann. Surg.* 181(4):455-457, 1975.

Details of three cases of endoscopically proven anastomotic ulceration were reported in patients with histamine-fast achlorhydria. Basal secretion was collected in 15-min samples for 1 hr; volume and pH determinations were made. Histamine acid phosphate (0.04 mg/kg) was injected s.c. after basal secretion collection and 20 mg benadryl was also injected to minimize side effects. Two cases demonstrated anemia and two had pernicious anemia. Achlorhydria was present even in the two who had not undergone vagotomy. All three patients had a history of alcohol abuse, and one abused aspirin as well. The cases demonstrated that achlorhydria did not protect against anastomotic ulceration and that it may be erroneous to consider all anastomotic ulceration as a continuation of the original peptic disease. The results suggest that stomal ulceration is frequently a multifactorial disease which occurs because the gastrojejunal stoma has less resistance to damage than does the adjacent unaltered gastric and jejunal mucosa.

4510 A CONTROLLED, RANDOMIZED TRIAL OF HIGHLY SELECTIVE VAGOTOMY VERSUS SELECTIVE VAGOTOMY AND PYLOROPLASTY IN THE TREATMENT OF DUODENAL ULCER. *(E.)* Kronborg, O.; Madsen, P. (Bispebjerg Hosp., Copenhagen, Denmark). *Gut* 16(4):268-271, 1975.

The results of highly selective vagotomy without drainage and selective vagotomy with pyloroplasty for duodenal ulcer were compared in a randomized, controlled trial of a series of 100 patients. Fifty patients received one method of treatment and 50 the other. The clinical results were obtained 1 yr after operation. The frequency of dumping, diarrhea, and epigastric fullness was significantly lower after highly selective (6, 6, and 8%) than after selective vagotomy (30, 20, and 28%). Recurrent and persisting duodenal ulcers appearing 1-4 yr after operations were significantly more frequent after highly selective (22%) than after selective vagotomy (8%). No significant relations were found between recurrent ulceration and gastric acid secretion measurements after the two operations. The Hollander response was early positive in 28% and late positive in 30% of the patients subjected to highly selective vagotomy, while the corresponding figures after selective vagotomy were 26 and 32%, resp. The results suggest that the low frequency of dumping and diarrhea after highly selective vagotomy is offset by a high recurrence rate, and according to Visick grading, a complementary relation exists between recurrence and post-vagotomy symptoms in surgery for duodenal ulcer.

4511 GASTRIC-ACID OUTPUT, PEPSIN OUTPUT, AND LEAN BODY MASS IN NORMAL AND DUODENAL-ULCER SUBJECTS. *(E.)* Elder, J. B.; Smith, I. S. (R. Infirm., Manchester, England). *Lancet* 1(7914): 1000-1003, 1975.

The relation of pepsin output to gastric acid output and to lean body mass were investigated in 13 normal subjects and 40 duodenal ulcer patients. Peak pepsin output was stimulated by insulin-induced hypoglycemia and the enzyme was assayed by Piper's method. Peak acid output was determined following pentagastrin (6 µg/kg, s.c.). Pepsin output correlated significantly with acid output in normal subjects, and also showed good correlation with lean body mass. In the duodenal ulcer patients, there was no significant overall correlation of pepsin output with acid output or with lean body mass; however, based on the ratios of the three variables, the ulcer patients were separated in two groups whose ratios appeared to correlate with their symptomatic state at time of testing: pepsin output/mEq acid/kg lean body mass was significantly greater for patients in relapse than for patients in remission and for the normal group. The results suggest that both acid and pepsin may be important factors in inducing relapse in duodenal ulcer patients, and that pepsin output studies may prove helpful in understanding pathogenesis of relapse.

4512 SULFHYDRYL COMPOUNDS OF THE GASTRIC MUCOSA IN PATIENTS WITH PEPTIC ULCER. *(Rus.)* Samson, E. I.; Gaidichuk, S. T. (Chernovitsy Med. Inst., USSR). *Vrach. Delo* (1):12-15, 1975.

Sulfhydryl compounds were studied in 35 patients with peptic ulcer at the time of acute and moderate aggravation of the disease. Nine patients had normal structure of the mucosa; 24 had surface gastritis; in two patients peptic glands were affected but there was no evidence of atrophy. Acidity was elevated in 28 (pH below 1.5); normal in six (pH = 1.5 - 2.4); and low in one. It was demonstrated that in cases with normal mucosa and surface gastritis, sulfhydryl compounds were present in the basal membrane of surface epithelium and gastric fossae. The apical areas of both the surface epithelium and fossae were free from sulfhydryl compounds. In patients with marked morphological changes in the mucosa, sulfhydryl compounds were observed in the surface epithelium. There was evidence of faint staining in the epithelia of basal membrane and gastric fossae. A correlation was established between the intensity of staining of the parietal cells and elevated acidity. It is concluded that the distribution of sulfhydryl compounds in gastric mucosa of peptic ulcer patients correlates with the type of concomitant gastritis. It is suggested that sulfhydryl compounds may be involved in acid production.

4513 GASTRIC AND DUODENAL ULCERS. *(Fr.)* Lambert, R. (Med. Fac., Lyon, France). *Recherche* 5(45):436-446, 1974.

4514 RECENT INFORMATION ABOUT THE PATHOGENESIS OF STOMACH ULCERS AND ITS IMPLICATIONS FOR THERAPY. *(Ger.)* Rothmund, M. (Surg. Clin., Univ. Mainz, Germany). *Therapiewoche* 24(39):4221-4222, 4224, 4227, 1974.

4515 PATHOGENESIS AND AETIOLOGY OF ULCER DISEASE. PART I: GASTRIC ULCER. *(E.)* Blum, A. L.; Peter, P.; Krejs, G. J. (Triemli Munic. Hosp., Switzerland). *Acta Hepatogastroenterol. (Stuttg.)* 22(1):47-54, 1975.

4516 COMMON GASTROENTEROLOGICAL PROBLEMS. III: CHRONIC BENIGN GASTRIC ULCER. *(E.)* Salter, R. H. (Cumberland Infirm., Carlisle, England). *Practitioner* 214(1281):407-411, 1975.

4517 ASSESSMENT AND TREATMENT OF RECURRENT PEPTIC ULCERATION. *(E.)* Steinberg, D. M.; Masselink, B. A.; Alexander-Williams, J. (Gen. Hsop., Birmingham, England). *Ann. R. Coll. Surg. Engl.* 56 (3):135-140, 1975.

4518 THERAPEUTIC TRIAL OF PROGLUMIDE IN GASTRO-DUODENAL DISEASES. *(Fr.)* Brandt, C.; Peter, B.; Stahl, A.; Bockel, R. (Hosp. Cent., Univ. Strasbourg, France). *J. Med. Strasbourg* 5(6/7):493-496, 1974.

4519 AN ASSESSMENT OF THE REPRODUCIBILITY AND SAFETY OF 2-DEOXY-D-GLUCOSE AS A GASTRIC ACID STIMULANT IN DUODENAL ULCER PATIENTS. *(E.)* Gough, A. L.; Keddie, N. C. (Manchester R. Infirm., England). *Gut* 16(3):171-176, 1975.

4520 INTRAGASTRIC TELEMETRIC EVALUATION OF THE EFFICACY AND DURATION OF ACTION OF VARIOUS BUFFER SUBSTANCES AND AN ANTICHOLINERGIC DRUG ADMINISTERED ORALLY. *(E.)* Plessier, J.; Economopoulos, P.; Kusha, I.; Chehab, A. (St. Antione Hosp., Paris, France). *Arzneim. Forsch.* 24(12):2051-2053, 1974.

4521 COMPARISON OF THE EFFECT OF VAGOLYTIC AGENTS AND VAGOTOMY ON THE ELECTROGASTROENTEROGRAPHS OF FASTING PATIENTS WITH DUODENAL ULCERS. *(Fr.)* Bertrand, J.; Thillier, J. L. (Univ. Hosp. Cent., Tours, France). *Biol. Gastroenterol. (Paris)* 7(4):292, 1974.

4522 TRANSTHORACIC VAGOTOMY IN TREATING PEPTIC ULCERS IN THE JEJUNUM. *(Ger.)* Groteluschen, B.; Reichel, K.; Pichlmayr, R. (Med. Coll., Hannover, Germany). *Chirurg* 45(10):462-464, 1974.

4523 SELECTIVE PROXIMAL VAGOTOMY WITHOUT DRAINAGE OPERATION. *(Hun.)* Berger, R. (Dombovar City Hosp., Hungary). *Magy. Sebesz.* 27(5): 285-287, 1974.

4524 PHYSIOLOGICAL AND CLINICAL SIGNIFICANCE OF HIGHLY SELECTIVE VAGOTOMY WITHOUT A DRAINAGE PROCEDURE. *(E.)* Johnston, D. (Gen. Infirm., Leeds, England). *Digestion* 11(3/4):275-288, 1974.

4525 HIGHLY SELECTIVE VAGOTOMY FOR DUODENAL ULCER: IS ANTRECTOMY NEEDED FOR THE HYPERSECRETORS? *(E.)* Pickford, I. R.; Johnston, D.; Walker, B. E.; Goligher, J. C. (Gen. Infirm., Leeds, England). *Br. J. Surg.* 62(2):152-153, 1975.

4526 THE EFFECT OF HIGHLY SELECTIVE VAGOTOMY AND TRUNCAL VAGOTOMY WITH PYLOROPLASTY ON GASTRIC EMPTYING OF SOLID FOOD IN MAN. *(E.)* Sheiner, H. J.; Duthie, H. L.; Barber, D. C.; Howlett, P. J. (Sheffield R. Infirm., England). *Br. J. Surg.* 62(2):163-164, 1975.

4527 VAGOTOMY ASSOCIATED WITH PYLOROPLASTY: RADIOLOGICAL STUDY. *(Por.)* de Carvalho Whitaker, J. de C.; Chacon, J. P.; Magalhaes, A. de A. (Paulist Med. Sch., Sao Paulo, Brazil). *An. Pau Paulistas Med. Chir.* 102(6):59-70, 1975.

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4529 OPERATIVE MORTALITY AND POSTOPERATIVE MORBIDITY OF HIGHLY SELECTIVE VAGOTOMY. *(E.)* Johnston, D. (Gen. Inform., Leeds, England). *Br. J. Surg.* 62(2):160, 1975.

4530 THE IMMEDIATE AND DELAYED EFFECTS OF DIFFERENT TYPES OF VAGOTOMY ON HUMAN GASTRIC MYOELECTRICAL ACTIVITY. *(E.)* Stoddard, C. J.; Smallwood, R.; Brown, B. N.; Duthie, H. L. (Sheffield R. Infirm., England). *Gut* 16(3):165-170, 1975.

4531 MUCOSA OF THE RESECTED STOMACH - HISTOTOPOGRAPHIC AND FUNCTIONAL INVESTIGATIONS. *(E.)* Stadelmann, O.; Miederer, S. E.; Elster, K. (Med. Polyclin., Bonn, Germany). *Acta Hepatogastroenterol. (Stuttg.)* 22(1):61, 1975.

4532 UNUSUAL PERFORATION OF A DUODENAL ULCER. *(Ger.)* Gunther, R.; Benken, U.; Schier, J. (Inst. Clin. Radiol., Univ. Mainz, Germany). *Fortschr. Geb. Roentgenstr. Nuklearmed.* 121(2):248-249, 1974.

4533 PEPTIC ULCER AND PULMONARY DISEASE. *(E.)* Viskum, K. (Bispebjerg Hosp., Copenhagen, Denmark). *Scand. J. Respir. Dis.* 55(5):284-290, 1974.

4534 RELATIONS BETWEEN PEAK STIMULATED GASTRIC SECRETION, BODY WEIGHT, AND ACTIVE BODY MASS IN PATIENTS WITH DUODENAL ULCERS. *(Ger.)* Jablonska, M.; Fucik, M.; Eiselt, E.; Malkovska, K. (4th Med. Clin., Charles Univ., Prague, Czechoslovakia). *Dtsch. Z. Verdua. Stoffwechselkr.* 34(2-4): 215-217, 1974.

4535 BLEEDING CAUSED BY ACUTE PEPTIC ULCERATION. *(Fr.)* Chigot, J. P. (Hosp. de la Pitie, Paris, France). *Rev. Fr. Gastroenterol.* (103):35-38, 41-42, 44, 1974.

4536 THE EFFECT OF ALMAGEL ON THE EXCRETION OF NEUTRAL 17-KETOSTEROIDS, DEHYDROISOANDROSTERONE AND FREE CATECHOLAMINES IN THE URINE OF PATIENTS WITH PEPTIC ULCER. *(Rus.)* Shevchenko, B. I. (Chernovitsy Med. Inst., USSR). *Vrach. Delo.* (3): 65-69, 1975.

4537 FLUCTUATIONS IN THE SKIN AND TEMPERATURE SENSITIVITY OF HEAD'S ZONES AND THEIR ROLE IN THERMOTHERAPY OF PEPTIC ULCER AND CHRONIC CHOLECYSTITIS. *(Rus.)* Solomianskii, A. E. (Dagestan Med. Inst., Makhachkala, USSR). *Vorp. Kurortol. Fizioter. Lech. Fiz. Kult.* (5):439-442, 1974.

4538 EFFECT OF SYMPATHECTOMY INDUCED BY GUANETHIDINE ON THE ULCEROGENIC ACTION OF PHENYLBUTAZONE IN RATS OF VARIOUS AGES. *(Sl.)* Kohut, A.; Nicak, A. (Med. Fac., Sararik Univ., Kosice, Czechoslovakia). *Cesk. Gastroenterol. Vyz.* 28(8):529-531, 1974.

4539 THE ULCEROGENIC EFFECT OF BILE AND BILE ACIDS IN RATS SUBJECTED TO IMMOBILIZATION STRESS. *(Ger.)* Wiesener, J. (Pathol. Inst., Free Univ., Berlin, Germany). *Z. Gastroenterol.* 12(7): 539-546, 1974.

See also, 4182, 4215, 4219, 4226, 4227, 4228, 4302, 4308, 4369, 4415, 4421, 4432, 4436, 4592, 5054, 5062.

SMALL INTESTINE

4540 INTESTINAL ENTEROKINASE DEFICIENCY. OCCURRENCE IN TWO SIBS AND AGE DEPENDENCY OF CLINICAL EXPRESSION. *(E.)* Haworth, J. C.; Hadorn,B.; Gourley, B.; Prasad, A.; Troesch, V. (Health Sci. Cent., Winnipeg, Canada). *Arch. Dis. Child.* 50(4):277-282, 1975.

Intestinal enterokinase deficiency in two siblings is described. The parents were not related, were healthy and free of gastrointestinal symptoms. A boy (6 weeks old) failed to gain weight and had vomiting, diarrhea, edema, hypoproteinemia, and anemia in early infancy. His duodenal juice contained very low or no proteolytic enzyme activity, which increased markedly after addition of enterokinase. He was treated with a regular diet with pancreatic extract and gained weight rapidly. At 44 months of age, he was normal, apart from some developmental delay, and no longer required pancreatic extract. The boy's older sister, who had similar symptoms in early infancy but then grew normally, had the same abnormality in her duodenal juice when seen at 4 yr. Enterokinase activity was virtually absent in the duodenal mucosa of both patients. Duodenal biopsies showed that the mucosal morphology was normal in both children. It is suggested that enterokinase deficiency is an inherited congenital defect and not the result of mucosal damage. Affected patients may show spontaneous improvement and normal growth after the age of 6-12 months. This phenomenon may be related to the decreasing growth velocity during the first 2 yr of life and the concomitant decrease in protein requirements/U body weight.

4541 INFLAMMATORY PSEUDOTUMORS (INFLAMMATORY FIBROUS POLYPS) OF THE SMALL INTESTINE: A CLINICOPATHOLOGIC STUDY. *(E.)* LiVolsi, V. A.; Perzin, K. H. (Coll. Physicians Surg., Columbia Univ., New York, N.Y.). *Am. J. Dig. Dis.* 20(4):325-336, 1975.

The clinical and pathologic features of 25 inflammatory pseudotumors of the small intestine are reported. For each specimen, pathology protocols, microscopic slides, and clinical records were reviewed. The group included nine males and 15 females (sex was unknown in one case) ranging in age from 6-86 yr (three patients were identified as adults only). In 16 patients, the diagnosis of small-intestinal obstruction, probably due to neoplasm, was made. The other patients were investigated for other reasons. All 25 patients underwent exploratory laparotomy. Sixteen lesions were found in the ileum and two in the jejunum. Intussusception was found associated with nine of 16 ileal lesions, with one of two jejunal tumors and with four cases in which the exact location of the lesion was unspecified. All 22 patients with lesions of the ileum or jejunum were treated by resection of the involved bowel segment. Of three patients with duodenal lesions, one underwent partial gastrectomy, one had a local excision of a duodenal nodule, and one was biopsied *via* a duodenotomy. Histologically, many cell types were noted in all these cases: fibrocytes, histiocytes, lymphocytes, scattered plasma cells, endothelial cells, leukocytes, and eosinophils. Mucosal involvement was found in 22 specimens. The etiology of the intestinal pseudotumor is unknown. No specific symptoms, laboratory tests, or x-rays established the diagnosis preoperatively. Even at laparotomy, the differential diagnoses included various neoplasms; only by histologic examination could the correct diagnosis be made. Following resection of the involved segment of small intestine, prognosis appears excellent. None of the patients for whom follow-up information was available had a recurrence of disease. It is suggested that intestinal pseudotumors may represent an exuberant granulation tissue response to mucosal ulceration.

4542 THERAPEUTIC CONSIDERATIONS REGARDING 75 PERFORATIONS OF THE SMALL INTESTINE. *(Fr.)* Spay, G. (No affil.). *Lyon Chir.* 71(1):34-38, 1975.

During 17 months in Kabul, Afghanistan, 55 cases of ileal perforation were observed including: 31 perforations due to typhoid; eight to *Ascaris*; three to multiple causes which included *Ascaris* in all three, typhoid in two and intestinal constriction of unknown etiology in the third; one case was due to stress; seven were of indeterminate etiology; and five unclassifiable due to incomplete records. Overall, the mortality rate was 37%, excluding three cases treated very recently. The patients ranged in age from 1.5 to 70 yr with most aged from 10-20 yr. The peak seasons for the perforations were in July, the rainy season following the Indian monsoon, and November, the dry period. Excision and suture was practiced in 13 cases, with success in 77%. This seems to be the optimum treatment for younger patients regardless of etiology. Exteriorization was practiced in 12 cases with only 42% success. This technique seems advisable with reservation in serious cases of typhoid in younger patients. Resection and temporary ileostomy was practiced 25 times, with 64% success. In 17 months in Dakar, Senegal, 20 cases of perforations were seen. They included one confirmed case of typhoid; five of multiple etiology with *Ascaris* in all five; nine of indeterminate etiology, of which six were suspected typhoid; one each with tuberculosis and excessive cortisone treatments; and three unclassifiable cases. The overall mortality was 50%. Simple suture in 13 cases produced 54% success and resection with anastomosis in four cases produced 50% success. Of the verified or strongly suspected cases of typhoid perforation, the mortality in the Kabul cases was 26%, compared with 33% for the Dakar cases. In general, simple suture is the preferred treatment and particularly favors the prognosis when the patient is seen less than a week after the onset of symptoms. Resection with terminal ileostomy should be reserved for the more serious cases.

4543 INTESTINAL LYMPHANGIECTASIA. LONG-TERM RESULTS WITH MCT DIET. *(E.)* Tift, W. L.; Lloyd, J. K. (Inst. Child Health, London, England). *Arch. Dis. Child.* 50(4):269-276, 1975.

The clinical course of six children with primary intestinal lymphangiectasia who were treated with low fat medium chain triglyceride-supplemented diets for 3-8 yr (four for longer than 5 yr) is described. All children showed rapid and sustained improvement in dependent edema; the asymmetrical edema, resulting from peripheral lymphatic anomalies, was unaffected by dietary and diuretic therapy. The low lymphocyte counts and reduced serum concentrations of albumin and IgG continued on the medium chain triglyceride diet. Laboratory tests indicated continuing chyle leak. Deliberate attempts to relax the restriction of dietary long chain fats were made in four patients. In three, diarrhea consistently recurred within 2-3 weeks of the introduction of a modest amount of long chain fat; two children also developed dependent edema and one ascites. In all three, symptoms subsided with the return to the medium chain triglyceride diet. It is claimed that laboratory evidence of continuing chyle leak does not indicate that treatment has no effect; return of biochemical findings to normal should suggest re-evaluation of the patient to determine whether the chyle leak has ceased, as occurred in one of six children in this group. For the majority of patients, however, it is likely that excessive gastrointestinal protein loss will continue. It is concluded that if such children are to achieve their optimum growth rate, it is necessary to continue a strict low-fat diet, supplemented with medium-chain triglycerides, at least until after puberty.

4544 INTESTINAL LYMPHANGIECTASIA: A REAPPRAISAL. *(E.)* Vardy, P. A.; Lebenthal, E.; Scwachman, H. (Child. Hosp. Med. Cent., Boston, Mass.). *Pediatrics* 55(6):842-852, 1975.

Fifteen children (nine boys and six girls) seen between 1960-1974 with histologically proven intestinal lymphangiectasia (IL) were analyzed retrospectively by clinical, laboratory, radiologic, and histologic criteria. Remissions occurred in most patients and none died. Exacerbations occurred in five children. Diarrhea was present in 14 cases and 13 patients presented before the age of 3 yr. Vomiting occurred in eight patients and growth retardation in seven. Four children had associated peripheral lymphedema and two of these had a family history of lymphedema; both had affected fathers and one had affected siblings and paternal cousins. Seven had hypoproteinemic edema and four of these suffered from hypocalcemic seizures. Chylous effusions were present in five; hypoproteinemia was present in 12 although five had no hypoalbuminemic edema. Six had lymphopenia which was related to the severity of the disease and was the last abnormality to disappear after clinical remission. Upper gastrointestinal tract series were performed in 13 children and had diagnostic supportive value in seven. Six children had two or more small intestinal biopsies done; all showed great variation from one examination to the other, ranging from a normal appearance to severe changes. Lymphatic block may occur at different sites: in the lamina propria only, generalized (lamina propria, submucosa, serosa, and mesentery), or conversely in the mesentery alone with minimal changes in the lamina propria. In three patients i.v. hyperalimentation was necessary. Specific treatment with a high-protein, low-fat diet with added medium-chain triglyceride is valuable. Surgical resection was of benefit in one patient and anastomosis of mesenteric to paraaortic lymph nodes in another. The data indicate that intestinal lymphangiectasia is more common than has been suspected and that the condition may vary widely in its manifestations and severity.

4545 BLEEDING MECKEL'S DIVERTICULUM DIAGNOSED BY ARTERIOGRAPHY AND RADIOISOTOPE IMAGING. *(E.)* Eisenberg, D.; Sherwood, C. E. (Highland Hosp., Rochester, N.Y.). *Am. J. Dig. Dis.* 20(6):573-576, 1975.

A 24-yr-old man with massive intestinal bleeding from a Meckel's diverticulum was diagnosed preoperatively by both abdominal arteriography and radioisotope imaging with technetium pertechnetate. A superior mesenteric arteriogram demonstrated pooling of contrast medium in the region of the distal ileum, to the right of the sacrum. The follow-up technetium imaging study showed accumulation of radioactivity corresponding to the angiographic pooling. At laparotomy, a large diverticulum of the ileum was found which contained ectopic gastric mucosa. The diverticulum and a short ileal segment were resected and an end-to-end anastomosis was performed. The surgical specimen revealed superficial erosion and ulceration of the ileal-bowel mucosa immediately adjacent to the diverticulum. When a bleeding Meckel's diverticulum is present, selective mesenteric artery arteriography may reveal either a localized area of vascularity in the right lower quadrant representing a richly vascular gastric tissue or puddling of contrast media near the site of active bleeding. Both these features existe in the present case The technetium pertechnetate ion is concentrated in functional ectopic tissue as well as in the stomach. Imaging is best performed with a gamma camera. False-negative findings in abdominal arteriography and technetium imaging may be caused by faulty technique or insufficient secretory gastric mucosa within the Meckel's diverticulum. False-positive findings have been reported n association with intestinal hemangiomas, aneurysms, and intestinal ulceration. Both examinations ppear to be promising adjuncts for the preoperaive diagnosis of bleeding Meckel's diverticulum.

546 CONGENITAL ATRESIA OF THE SMALL INTESTINE (FORMAL GENESIS, DIAGNOSIS AND THERAPY). *Ger.)* Schickedanz, H.; Kleinteich, B. (Surg. Clin., riedrich Schiller Univ., Jena, Germany). *Wiss. . Friedrich Schiller Univ. Jena Math. Naturwiss. eihe* 23(3/4):625-636, 1974.

547 FAMILIAL SYNDROME OF SHORT SMALL INTESTINE WITH INTESTINAL MALROTATION AND HYPERTRO- HIC PYLORIC STENOSIS IN INFANTS. *(Fr.)* Royer, P.; icour, C.; Nihoul-Fekete, C.; Pellerin, D. (Hosp. ick Child., Paris, France). *Arch. Fr. Pediatr.* 1(2/3):223-230, 1974.

548 ROTATION ANOMALY AS CAUSE OF INTESTINAL OBSTRUCTION IN THE NEWBORN. *(Ger.)* May, on D. A. (Child's Hosp. Med. Cent., Boston, Mass.). *ortschr. Geb. Roentgenstr. Nulkearmed.* 121(2):179-85, 1974.

549 INTESTINAL VOLVULUS. *(It.)* Mensorio, C.; Petrocchi, G.; Magnoni, E. (Inst. Clin. athol. Clin. Propedeut., Univ. Cagliari, Italy). *hir. Ital.* 26(2):140-172, 1974.

4550 VASCULAR COMPRESSION OF THE DUODENUM. *(It.)* Dell'Anna, B. (Inst. Spec. Surg. athol. Clin. Propedeut., Univ. Parma, Italy). *Acta hir. Ital.* 30(3):237-251, 1974.

4551 BENIGN TUMORS OF THE DUODENUM: LIPOMA. *(Fl.)* Kets, E.; Tanghe, W. (H. Hart Clin., oeselare, Belgium). *Tijdschr. Gastroenterol.* 17 (2):71-86, 1974.

4552 RADIOGRAPHIC AND DUODENOSCOPIC VISUALIZATION OF POLYPOID CHANGES IN THE DUODENUM. *(Cz.)* Maratkia, Z.; Kocianova, J.; Pirk, F.; Kudrmann, J. (Bulovka Hosp., Prague, Czechoslovakia). *s. Gastroenterol. Vyz.* 29(1):7-12, 1975.

4553 PEUTZ-JEGHERS SYNDROME. *(E.)* Edelman, M. J.; Sternberg, S. S. (no affil.). *Clin. ull.* 5(1):24-25, 1975.

4554 PRIMARY GRANULOCYTIC SARCOMA OF THE SMALL BOWEL. *(E.)* Brugo, E. A.; Larkin, E.; olina-Escobar, J.; Costanzi, J. (Univ. Texas Med. Branch, Galveston). *Cancer* 35(5):1333-1340, 1975.

4555 INTESTINAL LEIOMYOSARCOMA STIMULATING MALIGNANT OVARIAN NEOPLASM. *(E.)* Ng, K. H.; Prathap, K. (Dep. Obstet. Gynecol. Pathol., Univ. Malaya, Kuala Lumpur, Malaysia). *Int. Surg.* 60(4): 237-238, 1975.

4556 MANIFEST INTESTINAL INVOLVEMENT DURING BONE-MARROW REMISSION IN A CASE OF ACUTE LYMPHOBLASTIC LEUKAEMIA. *(E.)* Aronson, A. S.; Garwicz, S.; Landberg, T.; Nelson, O.; Brun, A. (Univ. Hosp., Lund, Sweden). *Acta Pediatr. Scand.* 64(2):369-372, 1975.

4557 HODGKIN'S DISEASE OF THE DUODENUM PRESENTING WITH HAEMORRHAGE AND PERFORATION. *(E.)* Bardhan, K. D.; McArthur, P.; Rigby, C. (R. Hosp., Sheffield, England). *Postgrad. Med. J.* 51 (593):180-182, 1975.

4558 MALIGNANT TUMORS OF THE SMALL INTESTINE. *(It.)* Roviera, C.; Bologna, A.; Paganelli, F. (Inst. Gen. Clin., Surg., Univ. Turin, Italy). *Minerva Chir.* 29(22):1186-1195, 1974.

4559 PERFORATION OF A JEJUNAL NEUROFIBROMA. *(Rus.)* Usanov, A. P. (No. 28 Munic. Hosp., Gorky, USSR). *Vestn. Khir.* 114(2):130-131, 1975.

4560 THE DIAGNOSIS OF MYOGENOUS TUMORS OF THE SMALL INTESTINE. *(Rus.)* Mazanov, G. S.; Volchek, V. M.; Zolin, V. P. (Kalinin Med. Inst., USSR). *Klin. Khir.* (4):67, 1975.

4561 ABDOMINAL SYNDROME DUE TO SMALL INTESTINE METASTASES. *(Fr.)* Bernier, L.; Bertrand, M. B. (Hotel Dieu, Quebec, Canada). *Vie Med. Can. Fr.* 3(7):645-647, 1974.

4562 HEMOPERITONEUM DUE TO RUPTURE OF HEMANGIOPERICYTOMA OF THE SMALL BOWEL. *(It.)* Palagiano, V.; Liguori, L. (Clin. Gen. Surg. Surg. Ther., Univ. Bologna, Italy). *Acta Chir. Ital.* 30 (3):287-299, 1974.

4563 GIANT INTESTINAL LEIOMYOMA. *(Sp.)* De la Calle, F.; Senor Uria, C.; Riquelme, P.; Perez Sotelo, R.; Luna, A. (Virgen de Lluc Hosp., Palma de Mallorca, Spain). *Rev. Esp. Enferm. Apar. Dig.* 45(3):325-328, 1975.

4564 MULTIPLE LEIOMYOMAS OF THE SMALL INTESTINE MANIFESTED BY ACUTE ANEMIA. *(Fr.)* Aubert, P.; Lainee, R.; Lainee, J.; Fihey, M. A. (Paul Brousse Hosp., Villejuif, France). *Ann. Med. Interne* 126(4):279-283, 1975.

4565 TWO UNUSUAL CASES OF LEIOMYOMA OF THE DUODENOJEJUNAL JUNCTION. *(It.)* Bobbio, P.; Sacco, M. (Inst. Gen. Clin. Surg. Surg. Ther. I, Univ. Parma, Italy). *Acta Chir. Ital.* 30(3):279-285, 1974.

4566 PRIMARY RETICULUM CELL SARCOMAS OF THE SMALL INTESTINE. *(Ger.)* Werner, V. R. (Kaiser Franz Josef Hosp., Vienna, Austria). *Zentralbl. Allg. Pathol.* 118(4):390-392, 1974.

4567 INTRAPARIETAL HEMATOMA OF THE SMALL INTESTINE. *(Fr.)* Monnier, J. P.; Bigot, J. M.; Chermet, J.; Fragoas, M. (St. Antoine Univ. Hosp. Cent., Paris, France). *J. Padiol. Electrol.* 55(3):217-222, 1974.

4568 DUODENAL HEMATOMA. CRITICAL ANALYSIS OF RECENT TREATMENT TECHNICS. *(E.)* Janson, K. L.; Stockinger, F. (Bergstrom Air Force Base Hosp., Austin, Tex.). *Am. J. Surg.* 129(3):304-308, 1975.

4569 DUODENOJEJUNAL OBSTRUCTION CAUSED BY AN INTRAMURAL, POST-TRAUMATIC HEMATOMA. *(Fr.)* Boustany, F. N.; Atallah, P.; Khoury, P. (Hotel Dieu, Beirut, Lebanon). *J. Med. Liban* 27(5):531-542, 1974.

4570 GALLSTONE ILEUS. *(Rus.)* Mitov, E.; Manchev, I. (Plovdiv Med. Fac., Bulgaria). *Khirurgiia (Mosk.)* (3):88-89, 1974.

4571 SURGICAL PROCEDURES IN GALLSTONE ILEUS. *(Ger.)* Hantschmann, N.; Voigt, J.; Becher, R. (Cent. Surg. Med. I, Univ. Kiel, Germany). *Langenbecks Arch.* 338(1):55-65, 1975.

4572 A SIMPLE EFFECTIVE AID IN THE TREATMENT OF ILEUS. *(Dut.)* Coene, J. A.; Houthooft, D. H. C. (St. Elisabeth Hosp., Tilbury, Netherlands). *Ned. Tijdschr. Geneeskd.* 117(46):1727-1728, 1973.

4573 CALCULOUS OBSTRUCTION SYNDROME OF THE PYLORUS AND DUODENUM. *(It.)* Preziosi, M.; Imbesi, C. (S. Spirito Pio Inst., Rome, Italy). *Chir. Gastroenterol.* 8(3):335-341, 1974.

4574 A CASE OF EPITHELIOMA ON HETEROTOPIC MUCOSA FOUND WITHIN A PERFORATED MECKEL'S DIVERTICULUM. REVIEW OF THE LITERATURE. *(Fr.)* (Thomas, G.; Thomas, M.; Otteni, F.; Meyer, C. (no affil.). *Chirurgie* 100(11):791-794, 1974.

4575 MECKEL'S DIVERTICULUM AS A CAUSE OF ACUTE ABDOMINAL DISEASE. *(Rus.)* Valigura, Ia. S. (Lvov Med. Inst., USSR). *Klin. Khir.* (4):48-50, 1975.

4576 PERFORATION OF MECKEL'S DIVERTICULUM IN INFANCY. *(E.)* Canty, T.; Meguid, M. M.; Eraklis, A. J. (Child. Hosp. Med. Cent., Boston, Mass.). *J. Pediatr. Surg.* 10(2):189-194, 1975.

4577 RADIOLOGY OF MECKEL'S DIVERTICULUM. *(Fr.)* Bret, P.; Minh, V. T.; Boisson, M.; Saint-Cyr, M.; Deliot, J. F.; Burelle, H. (Eduoard Herriot Hosp., Lyon, France). *Ann. Radiol. (Paris)* 17(5):479-485, 1974.

4578 ONE CASE OF A BLEEDING LEIOMYOMA OF MECKEL'S DIVERTICULUM. *(It.)* Marin, A. W.; Nanni, G.; Pescatori, M. (Inst. Clin. Gen. Surg. Surg. Ther., Sacred Heart Cathol. Univ., Rome, Italy). *Chir. Patol. Sper.* 21(4):285-292, 1973.

4579 CURRENT PROBLEMS IN THE DIAGNOSIS AND TREATMENT OF INTESTINAL FISTULAS. *(Rus.)* Chkeidze, R. D. (Tbilisi State Med. Inst., USSR). *Soobshch. Akad. Nauk Gruz. SSR* 77(1):221-224, 1975.

4580 SURGICAL TECHNIQUES FOR EXTERNAL FISTULAS OF THE SMALL INTESTINE. *(Fr.)* Maillet, P. (no affil.). *J. Med. Strasbourg* 5(5):393-395, 1974.

4581 THE VALUE OF PARENTERAL HYPERALIMENTATION FOR THE THERAPY OF INTESTINAL FISTULAS. *(Fr.)* Leutenegger, A. F.; Goschke, H.; Schuman, L. (Dep. Surg., Univ. Basel, Switzerland). *J. Med. Strasbourg* 5(5):389-392, 1974.

4582 OUR EXPERIENCE WITH THE SURGICAL MANAGEMENT OF POSTOPERATIVE EXTERNAL FISTULAS OF THE SMALL BOWEL. *(Fr.)* Hollender, L. F.; Otteni, F.; Meyer, C.; Marrie, A. (no affil.). *J. Med. Strasbourg* 5(5):415-421, 1974.

4583 RUPTURE OF THE INTESTINE IN PATIENTS WITH HERNIA. *(E.)* O'Leary, J. P.; Macgregor, A. M. C. (Coll. Med., Univ. Florida, Gainesville). *South. Med. J.* 68(4):463-467, 1975.

4584 THERAPY OF INGUINAL HERNIAS IN CHILDHOOD. *(Ger.)* Kleinteich, B.; Schickedanz, H.; Glasel, E. (Surg. Clin., Friedrich Schiller Univ., Jena, Germany). *Wiss. Z. Friedrich Schiller Univ. Jena Math. Naturwiss. Reihe* 23(3/4):637-642, 1974.

4585 INTESTINAL INTUSSUSCEPTION. *(It.)* Mensorio C.; Saracino, F.; Magnoni, E. (Inst. Surg. Pathol., Cagliari Univ., Italy). *Chir. Ital.* 26(3):230-245, 1974.

4586 RADIOLOGICAL SIGNS OF INTUSSUSCEPTION OF THE SMALL INTESTINE IN ADULTS: THREE CASES. *(Fr.)* Bret, P.; Piante, M.; Minh, V. T.; Boisson, M. (Eduoard Herriot Hosp., Lyon, France). *Ann. Radiol. (Paris)* 17(5):487-490, 1974.

4587 MULTIPLE SEGMENTAL DEMUSCULARIZATION IN THE TREATMENT OF SYNDROMES FOLLOWING EXTENSIVE INTESTINAL RESECTION. *(It.)* Perisi, P.; Arcerito, S.; Bacciu, P. P. (Inst. Clin. Gen. Surg. Surg. Ther., Univ. Sassari, Italy). *Chir. Patol. Sper.* 21(2):133-147, 1973.

4588 INVESTIGATION OF PATHOLOGICAL CHANGES IN THE INTESTINAL WALL. *(Ger.)* Bussmann, J. F.; Loewe, K. R.; Wemmer, U. (Surg. Clin., Univ. Heidelberg, Germany). *Bruns. Beitr. Klin.* 221(8): 605-610, 1974.

4589 PERFORATION AS A COMPLICATION OF JEJUNAL BIOPSY. *(Ger.)* Leinweber, B.; Schomerus, M. (Med. Clin., Justus Liebig Univ., Giesson, Germany). *Leber Magen Darm* 4(3):131-134, 1974.

4590 NON-SPECIFIC CHRONIC DUODENITIS: CONTEMPORARY DIAGNOSTIC POSSIBILITIES. *(Cz.)* Cheli, R.; Aste, H.; Ciancamerla, G. (San Marino Hosp., Genoa, Italy). *Cs. Gastroenterol. Vyz.* 28 (8):513-517, 1974.

4591 ENDOSCOPY OF THE UPPER AND LOWER DUODENUM. *(Cz.)* Benysek, L.; Kojecky, Z. (Intern. Med. Clin. II, Palacky Univ., Olomouc, Czechoslovakia). *Cs. Gastroenterol. Vyz.* 28(8):540-544, 1974.

4592 POSTOPERATIVE NECROTIZING ENTERITIS AFTER VAGOTOMY FOR DUODENAL BULB ULCER. *(Fr.)* Gautier-Benoit, G.; Pinchon-Marsy, S.; Vermesse, G.; Houcke, M. (no affil.). *Chirurgie* 100(11):777-780, 1974.

4593 METABOLIC INTESTINAL SURGERY. ITS COMPLICATIONS AND MANAGEMENT. *(E.)* Starkloff, G. B.; Donovan, J. F.; Ramach, K. R.; Wolfe, B. M. (St. Louis Univ. Hosp., Mo.). *Arch. Surg.* 110 (5):652-657, 1975.

4594 JEJUNO-ILEAL BYPASS AS TREATMENT OF INTRACTABLE OBESITY. *(E.)* Kosyak, E. P. (Hoopeston Comm. Mem. Hosp., Ill.). *Abdom. Surg.* 17(5):117-121, 1975.

4595 OBSERVATIONS ON THE HEALING OF WOUNDS OF THE INTESTINES. *(E.)* Ravitch, M. M. (Dep. Surg., Univ. Pittsburgh, Pa.). *Surgery* 77(5): 665-675, 1975.

4596 CYTOMETRIC ANALYSIS OF THE PARAVENTRICULAR NUCLEI IN RATS WITH OBSTRUCTION OF THE SMALL INTESTINE. *(Pol.)* Galasinska-Pomykol, I.; Stefanska-Sulik, E.; Chilimoniuk, M.; Oldak, B. (Inst. Biol. Morphol., Bialystok, Poland). *Endokrynol. Pol.* 25(5):361-368, 1974.

4597 DIGESTION AND ABSORPTION IN THE SMALL INTESTINE IN NORMAL SUBJECTS AND IN PATIENTS WITH CHRONIC ENTEROCOLITIS. *(Rus.)* Rybakova, G. S.; Zlatkina, A. R.; Ugolev, A. M. (M. F. Vladimirskii Moscow Reg. Res. Inst. Clin. Med., USSR). *Lab. Delo* (3):155-157, 1974.

4598 VILLOUS ADENOMAS AND MALIGNANT VILLOUS TUMOURS OF THE DUODENUM. CASE REPORT AND REVIEW OF LITERATURE. *(E.)* Dwyer, W. A.; O'Brien, R.; Maio, T. (St. Joseph's Hosp., Paterson, N.J.). *Conn. Med.* 39(5):286-290, 1975.

4599 DIVERTICULA OF MECKEL'S DIVERTICULUM. *(E.)* Kaneti, J.; Mares, A. J. (Soroka Med. Cent., Beersheva, Israel). *Am. J. Surg.* 129(5):597-598, 1975.

4600 SHORTENED SMALL BOWEL SYNDROME. MACKBY'S OPERATION. *(E.)* Camprodon, R.; Guerrero, J. A.; Salva, J. A.; Jornet, J. (Francisco Franco Munic. Sanit., Barcelona, Spain). *Am. J. Surg.* 129(5):585-586, 1975.

4601 CARCINOMA OF THE DUODENOJEJUNAL JUNCTION PRESENTING AS CHRONIC ANAEMIA. *(E.)* Martin, D. A. S.; Macarthur, E. (Australian Health Lab., Canberra). *Med. J. Aust.* 1(12):387-391, 1975.

See also, 3898, 4182, 4186, 4212, 4229, 4230, 4233, 4234, 4235, 4284, 4293, 4395, 4408, 4411, 4416, 4425, 4426, 4444, 4450, 4478, 4636, 4643, 4660, 4673, 4680, 4683, 4706, 4780, 4795, 4952, 5014, 5086, 5090, 5098, 5102, 5103, 5126, 5169, 5180, 5185, 5186, 5193.

SMALL INTESTINE

Malabsorption

4602 CONFIRMING PERSISTENCE OF GLUTEN INTOLERANCE IN CHILDREN DIAGNOSED AS HAVING COELIAC DISEASE IN INFANCY: USEFULNESS OF ONE-HOUR BLOOD XYLOSE TEST. *(E.)* Rolles, C. J.; Anderson, C. M.; McNeish, A. S. (Inst. Child Health, Univ. Birmingham, England). *Arch. Dis. Child.* 50(4): 259-263, 1975.

A p.o. gluten challenge (20 g/day) was given to 16 children diagnosed as having celiac disease when aged 3-11 months and who had been treated with a gluten-free diet for periods of 1 month to 5 yr. Xylose malabsorption was demonstrated in 15 children by a fall in the 1-hr blood xylose level within 1-28 days after gluten challenge. The fall tended to be more rapid in children who had been on a gluten-free diet for less than 6 months and who had residual abnormalities in the jejunum. However, xylose malabsorption was rapidly produced in four children who had been on a gluten-free diet for 7-10 months, including two with a normal prechallenge jejunal histology. One child, with a persistently normal 1-hr blood xylose test after gluten challenge for 3 months, had normal absorption and normal jejunal histology after 18 months on a gluten-containing diet; she is considered not to have celiac disease. These results demonstrate that the 1-hr blood xylose test before and after gluten challenge is helpful in confirming the persistence of celiac disease diagnosed in infancy.

4603 MALABSORPTION SYNDROME WITH COW'S MILK INTOLERANCE: CLINICAL FINDINGS AND COURSE IN 54 CASES.

(E.) Kuitunen, P.; Visakorpi, J. K.; Savilahti, E.; Pelkonen, P. (Child. Hosp., Univ. Helsinki, Finland). *Arch. Dis. Child.* 50(5): 351-356, 1975.

Clinical data are reported for 54 consecutive infants (25 boys and 29 girls) presenting with the malabsorption syndrome and cow's milk intolerance over a 10-yr period. All patients (mean age on admission, 15 weeks) had diarrhea, most had vomiting, and about 20% had atopic eczema and recurrent respiratory infections. Laboratory investigations revealed lactose malabsorption in about 1/2 the patients, raised serum IgA in 37 of 50, and precipitins to cow's milk in 32 of 49. Jejunal biopsy often showed severe mucosal damage of the type seen in celiac disease, and in about 1/2 the cases the mucosa was flat. The patients did well on human milk but reacted clinically to cow's milk challenge, either in a few hrs (28 cases) or gradually during 3-4 weeks (26); in some patients an initial rapid and a later slow reaction was discernible. Clinical symptoms of cow's milk intolerance disappeared at about age 1 yr, when 81% had normal fecal fat but only 29% a normal proximal jejunal mucosa. Positive reactions to cow's milk protein fractions were most frequent with β-lactoglobulin and casein. Sensitivity to cow's milk was also associated with intolerance to other food proteins such as soya and wheat. Of the 42 patients followed for 2 yr on a gluten-containing diet, 37 have a normal or nearly normal jejunal mucosa and 5 (12%) have subtotal villous atrophy indicative of celiac disease. It is concluded that the malabsorption syndrome with cow's milk intolerance is a clear-cut clinical entity. However, the symptomatology, results of laboratory tests, and jejunal biopsy findings closely resemble those of other entities where damage to the intestinal mucosa causes a malabsorption syndrome. Follow-up studies indicate that the disease is transient, but in about 10% of patients the primary disorder is celiac disease.

4604 ENTEROTOXIGENIC INTESTINAL BACTERIA IN TROPICAL SPRUE. II. EFFECT OF THE BACTERIA AND THEIR ENTEROTOXINS ON INTESTINAL STRUCTURE.

(E.) Klipstein, F. A.; Schenk, E. A. (Trop. Malabs. Unit, Univ. Rochester, New York). *Gastroenterology* 68(4):642-655, 1975.

Randomly selected strains of the predominant coliform bacteria (3 serotypes of *Kiebsiella pneumoniae* and a strain of *Enterobacter cloacae)* isolated from each of 4 Puerto Ricans with tropical sprue were examined for their effect on intestinal structure in the ileal loop model of 34 rabbits. The viable bacteria did not evoke a fluid response, invade the mucosa, or cause changes in villus architecture; but they did result in the formation of a luminal exudate consisting of mucin, necrotic epithelial cells, bacteria, and epithelial cell enzymes. Cell-free broth filtrates of bacterial growth of all 4 strains produced an increasingly positive fluid response from 2-18 hr and progressively more severe structural changes consisting of shortening and blunting of the villi, infiltration predominantly by mononuclear cells, and submucosal congestion. Equally hypermolar control preparations of broth-free medium without bacterial growth and cell-free broth filtrates of a nontoxigenic strain of *Escherichia coli* failed to induce these abnormalities. These observations indicate that the coliform bacteria tested elaborate a toxic product, presumably an enterotoxin, which produces structural and functional changes of the intestinal mucosa resembling those present in tropical sprue.

4605 ILEAL FUNCTION IN PATIENTS WITH UNTREATED ADULT COELIAC DISEASE.

(E.) Silk, D. B. A.; Kumar, P. J.; Webb, J. P. W.; Lane, A. E.; Clark, M. L.; Dawson, A. M. (St. Bartholomew's Hosp., London, England). *Gut* 16(4):261-267, 1975.

Jejunal and ileal absorption of glucose, water, and electrolytes in 8 patients (mean age, 38 yr) with untreated adult celiac disease was investigated with a double-lumen perfusion technique. Correct positioning of the tube was confirmed by measuring the differential jejunal and ileal handling of bicarbonate. The 8 patients and 8 controls (mean age, 40 yr) were perfused with an isotonic electrolyte solution containing 50 mM glucose and 25 mM bicarbonate. Compared with the controls, the celiac patients had significantly impaired jejunal absorption of glucose, water, sodium, and chloride. In contrast, the celiac patients had normal ileal glucose and water absorption and significantly increased ileal sodium and chloride absorption compared with the controls. Evidence for ileal adaptation was found in 3 patients who had absorptive values outside 2 standard deviations of the normal mean. These patients had greater ileal surface cell heights than the other celiac patients and tended to have taller villi than the remaining celiacs. This study indicates that the distal small intestine in celiac disease has the ability to adapt to the damage and loss of absorptive capacity in the proximal small intestine. The enhanced ileal function in celiac disease may be due to distal ileal mucosal cell hyperplasia ocurring in response to the jejunal mucosal lesion.

606 SMALL INTESTINAL BIOPSY IN COW'S MILK PROTEIN ALLERGY IN INFANCY. *(E.)* Fontaine,
. L.; Navarro, J. (Trousseau Hosp., Paris, France).
rch. Dis. Child. 50(5):357-362, 1975.

ntestinal biopsies were performed in 31 infants
19 girls and 12 boys, aged 3-30 months) with cow's
ilk protein intolerance. Mucosal damage was
bserved in 30 cases, including 4 infants biopsied
hile on a milk-free diet. Partial villous atrophy
as present in 25 cases, subtotal villous atrophy
n 1, and slight histological lesions in 4. Of
he 25 cases of partial villous atrophy, 5 were
rade I; 12, Grade II; and 8, Grade III. Complete
ucosal recovery occurred in 4 children after 3-13
onths on a milk-free diet. It is concluded that
he mucosal damage seen in cow's milk protein allergy
s induced by cow's milk, though the mechanism re-
ains unknown.

607 CELL-MEDIATED IMMUNITY TO GLIADIN WITHIN THE SMALL-INTESTINAL MUCOSA IN COELIAC
ISEASE. *(E.)* Ferguson, A.; MacDonald, T. T.;
cClure, J. P.; Holden, R. J. (West. Infirm.,
lasgow, Scotland). *Lancet* (7912):895-897, 1975.

n an attempt to demonstrate local cell-mediated
mmunity to gliadin in patients with celiac disease,
ragments of jejunal biopsy specimens were cultured
n the presence or absence of α-gliadin and the
ulture medium assayed for its capacity to inhibit
igration of normal human peripheral blood leukocytes
i.e., for a migration-inhibition factor MIF). No
IF activity was detected in the culture medium
hen biopsy specimens from 15 patients with celiac
isease or from 29 controls were cultured without
dded gliadin. The addition of α-gliadin (0.5 mg/
l) to the culture system did not result in MIF
ecretion by nonceliac mucosa or by the mucosa
rom 2 patients with celiac disease treated with
gluten-free diet. However, when biopsy specimens
rom 6 patients with untreated celiac disease were
ultured with α-gliadin, they secreted a factor
nto the culture medium which significantly in-
ibited the migration of normal human leukocytes
>30% inhibition in 5 of the 6 cases). These
indings suggest that there is a population of
ymphocytes which are sensitized to gliadin in the
ntestinal mucosa of patients with untreated celiac
isease. They support the theory that a local
ell-mediated immune reaction may be the cause of
illous atrophy and crypt hyperplasia in celiac
isease.

608 CHARACTERISTICS OF CARBOHYDRATE ABSORPTION AND METABOLISM IN PREMATURE AND NEWBORN
NFANTS. *(Ger.)* Beyreiss, K.; Rautenbach, M.; Will-
erodt, H.; Schone, S.; Al-Rebate, I. (Pediatr. Clin.,
arl Marx Univ., Leipzig, Germany). *Wiss. Z. Fried-*
ich Schiller Univ. Jena Math. Naturwiss. Reihe 21
(4):683-693, 1972.

arameters of the absorption and conversion of the
ructose and galactose were studied using blood level
inetic procedures in premature, newborn, nursing
infants, and healthy children and adults. Total clearance, absorption rate (Dost), and the concentration of the hexoses in blood, urine and stool were measured by specific methods. Characteristics of active monosaccharide absorption with adequate transport capacity in neonates was demonstrated in the first days of life. The low absorption rates of fructose in all age groups were caused in part by transformation in the small intestinal mucosa. For galactose also, a conversion upon passage through the intestinal mucosa was assumed with neonates and nursing infants in contrast to adults. The conversion rate of fructose was depressed in the neonatal period independent of maturity and attained the parameters of later infant age in the third week of life. In contrast, the optimal conversion range and the maximum conversion capacity for galactose with newborns was considerably greater than with adults. True premature infants showed hindered conversion of galactose only in the first days of life as compared to matured neonates. In the neonatal period, galactose raises the glucose concentration in the blood independent of the entrance location; fructose, however, raises blood glucose concentration only when given p.o.

4609 ABNORMALITIES OF SERUM CHOLECYSTOKININ AND GALLBLADDER EMPTYING IN CELIAC DISEASE. *(E.)* Low-Beer, T. S.; Harvey, R. F.; Davies, E. R.; Read, A. E. (R. Infirm., Bristol, England). *N. Engl. J. Med.* 292(18):961-963, 1975.

The relation between gallbladder contraction and serum cholecystokinin levels after a fatty meal was studied in 10 patients (7 men and 3 women, average age 58 yr) with adult celiac disease and 10 controls with no history of upper-intestinal tract disease. After an overnight fast, each subject drank 60 ml of a flavored emulsion of 33% peanut oil. Serum cholecystokinin levels, at various intervals after consumption of the emulsion, were measured by a radioimmunoassay technique; gallbladder emptying was monitored continuously *via* isotope cholecystography. In 9 of the patients, the fasting serum cholecystokinin levels were significantly raised over control values. However, the peak serum cholecystokinin levels and the increments in serum cholecystokinin after fat intake were lower in the celiac disease patients. Emptying of the gallbladder was less complete in the patients than in the controls and the onset of gallbladder emptying was significantly delayed in the former. The elevated fasting serum cholecystokinin levels in the celiac disease patients may have resulted from increased secretion of the hormone by the enterochomaffin-like cells in the small-bowel mucosa; this might result from a disturbance in some regulatory mechanism for hormone secretion. Available evidence suggests that the gallbladder in celiac disease is less responsive than normal to the action of endogenous cholecystokinin. The pathogenesis of the diminished pancreatic exocrine response which has been noted in celiac disease is probably similar to that of the diminished gallbladder contraction. Resistance to the action of cholecystokinin in both cases may in some way be related to the presence of constantly high levels of this hormone in the blood.

4610 ULTRASTRUCTURAL AND HISTOCHEMICAL STUDY OF THE BACTERIAL DESTRUCTION IN TWO CASES OF WHIPPLE'S DISEASE.

(Fr.) Chamlian, A.; Casanova, P.; Cougard, A.; Mathieu, B. (Fac. Med., Marseille, France). *Ann. Anat. Pathol. (Paris)* 19(2):221-230, 1974.

The destruction of bacteria in two men aged 40 and 45 with Whipple's disease was studied by examination of specimens of jejunal mucosa obtained by peroral biopsy from the duodeno-jejunal flexure, both before and after a 7-month course of treatment which established remission. In one case the treatment was 1 g/day erythromycin, and in the other case it was 0.2 g/day doxycyclin. In the untreated cases, bacteria were concentrated in the mucous chorion of the intestinal villi and may accumulate under the basal epithelial basal membrane at the apex of the villi. Bacteria are often located around fatty particles and are often vacuolized. When they penetrate the villous chorion, they are attacked and digested by macrophages. At the inferior part of the mucosa, between the glandular cul-de-sacs and the muscularis mucosae, the macrophages seem to be less active than at the top of the villi, as they do not contain bacterial bodies but rather granular or filamentous material. During remission, bacteria are no longer visible, and the residual macrophages contain lamellate or granular material. In the untreated disease, the macrophages at the top of the villi are strongly colored by para-aminosalicylic acid which indicates the presence of neutral mucopolysaccharides. They have no affinity for colloidal iron, whereas the macrophages at the inferior part of the mucosa have the opposite affinities. During remission, the few remaining macrophages at the top of the villi react with both para-aminosalicylic acid and colloidal iron, while the more numerous deeper macrophages contain occasional particles reactive with para-aminosalicylic acid and many voluminous vacuoles with a moderate reaction to colloidal iron. The para-aminosalicylic acid undoubtedly is made to react by the mucopeptides contained in the bacterial wall. Acid phosphatase activity is great in the superficial macrophages and moderate in the deeper macrophages in the untreated disease. Apparently, macrophages at the top of the villi ingest material and migrate deeper into the mucosa as they digest it.

4611 CLINICAL, IMMUNOLOGICAL AND ELECTRON MICROSCOPE STUDIES OF WHIPPLE'S DISEASE.

(Ger.) Buchholz, K.; Maintz, J.; Otto, H. F. (Hamberg-Heidberg Hosp., Germany). *Klin. Wochenschr.* 52(14):672-677, 1974.

An unusual course of Whipple's disease is reported. The patient (male, 57 yr) had a stomach resection for bleeding ulcer about 1/2 year prior to admission and was in generally poor health; malabsorption was suspected. Small intestinal biopsy was performed and Whipple's disease was confirmed on the basis of light and electron microscope evidence. Treatment with tetracycline (Vibramycin, 100 mg/day) resulted in rapid disappearance of clinical symptoms, weight gain, and return to normal levels of blood chemical data. A persistent clinical remission was noted 1 yr later with continued antibiotic therapy. As early as 5 months after institution of therapy multiple control biopsies showed a strong and progressive collagen formation of the stratum propium mucosae, especially in the pericellular region and near the epithelial basal membrane. The number of lymphocytes, plasma cells and interepithelial lymphoid round cells increased considerably. Immunologically, the serum complement (C_3-fraction) was decreased. Immunohistologically, subepithelial and interepithelial cells were found after incubation with the patient's serum showing a cellular-cytoplasmic fluorescence with anti-complement. These findings indicate a hyper-reactive mechanism possibly leading to induction of a cellular immune process.

4612 HISTOCHEMICAL STUDY OF ENTEROKINASE IN DUODENAL AND JEJUNAL BIOPSIES FROM CHILDREN WITH MALABSORPTION SYNDROME.

(Cz.) Lojda, Z.; Jodl, J. (Fac. Gen. Med., Charles Univ., Prague, Czechoslovakia). *Cesk. Gastroenterol. Vyz.* 28(8):532-539, 1974.

Since histological studies of unaffected parts of the duodenum and jejunum, removed from two patients at surgery, demonstrated that enterokinase activity is much higher in the duodenum than in the jejunum, duodenal biopsies were taken from children with a variety of malabsorption syndromes. Using a method described previously, the enterokinase activity in duodenal biopsies taken from the mid-duodenum in patients without gastrointestinal symptoms reached a maximum in the enterocytes after 2 hr of incubation and was so high on the top and along the sides of the villi that a diffuse reaction product was seen as far as the lamina propria. After this incubation period, the cytoplasm of Brunner's glands was stained only nonspecifically by the diazo reaction and the enterokinase activity in the epithelium of the crypts was very low. Enterokinase activity in duodenal biopsies from three children with pancreatogenic malabsorption was similar to that found in five children with no evidence of gastrointestinal disease. Normal enterokinase activities were also found in duodenal biopsies from two children with lactase deficiency, as diagnosed by jejunal biopsies, and from five of nine children with diarrhea of unknown etiology; enterokinase activities were decreased in the remaining four cases. Only moderate irregularities in mucosal relief and moderate inflammatory changes were observed in these cases of diarrhea. Duodenal enterokinase activities were normal in four and decreased in eight patients with cow's milk intolerance and normal lactase activities. No enterokinase at all was present in the duodenum of the remaining four patients, even when biopsies were repeated. Duodenal enterokinase activities were normal in 12 and decreased in 12 children with manifest celiac disease. Of seven patients with celiac disease in remission, five exhibited normal duodenal enterokinase activity and two, decreased activity. In four cases (one patient each with disaccharide deficiency, cow's milk intolerance, manifest celiac disease and celiac disease in remission), biopsies from the distal duodenum had no evidence of enterokinase activity.

613 THE CURRENT TENDENCY TO RECONSIDER THE CLASSIFICATION OF MALABSORPTION SYNDROMES: LUTEN-INDUCED ENTEROPATHY. *(Rum.)* Iancu, A. Th.; ancu, A. V. (Med. Pharm. Inst., Cluj, Rumania). *ev. Med. Chir.* 78(2):283-288, 1974.

614 PROTEIN-LOSING ENTEROPATHY IN A SIX-MONTH-OLD INFANT. *(Rus.)* Loseva, A. G.; Novohilova, Z. I. (I. I. Pavlov Med. Inst., Leningrad). *ediatriia* (3):83-84, 1975.

615 ENZYMES AND ABSORPTION IN THE SMALL INTESTINE IN ELDERLY SUBJECTS. *(Rus.)* Valenevich, L. N. (Leningrad Inst. Pediatr. Med., USSR). *lin. Med. (Mosk.)* 52(7):89-93, 1974.

616 DIAGNOSTIC AND THERAPEUTIC ASPECTS OF DISORDERS IN ABSORPTION AND DIGESTION IN EL-ERLY SUBJECTS. *(Ger.)* Dietze, F.; Laue, R.; chultz, H. J.; Kalhe, I. (Med. Clin., Humboldt Univ., erlin, Germany). *Z. Alternsforsch.* 28(2):125-135, 974.

617 CLINICAL ASPECTS AND TREATMENT OF DISORDERS IN BILE ACID METABOLISM OCCURRING IN DIS-ASES OF THE SMALL INTESTINE. *(Ger.)* Fromm, H. Med. Coll., Hannover, Germany). *Verh. Dtsch. Ges. nn. Med.* 80:421-427, 1974.

618 SERUM LEVELS OF VITAMIN A (RETINOL) AND RETINOL-BINDING-PROTEIN (RBP) IN MALAB-ORPTION, DIGESTIVE DISEASES, AND CIRRHOSIS. *(Ger.)* rellwitz, W.; Olbermann, M.; Kapp, S.; Muller, D.; roth, U. (Med. Clin. II, Univ. Mainz, Germany). *lin. Wochenschr.* 52(19):921-925, 1974.

619 CALCIUM ABSORPTION IN OBESE SUBJECTS DURING FASTING. *(Cz.)* Kocian, J.; Rath, R. Inst. Postgrad. Med. Pharm., Prague, Czechoslovak-a). *Cesk. Gastroenterol. Vyz.* 28(7):454-460, 1974.

620 PERORAL BIOPSIES OF THE INTESTINAL MUCOSA. COMPARITIVE STUDIES ON THE HISTOLOGICAL ND DISSECTING MICROSCOPE FINDINGS. *(Ger.)* Schmidt, .; Scholl, A. (Pediatr. Clin., Univ. Tubingen, Ger-any). *Z. Kinderheilk.* 191(1):37-45, 1975.

621 COW'S MILK PROTEIN INTOLERANCE. TRANSIENT FOOD INTOLERANCE OF INFANCY. *(E.)* Walker-mith, J. (R. Hosp. St. Bartholomew, London, England). *rch. Dis. Child.* 50(5):347-350, 1975.

622 THE MORPHOLOGY OF THE SMALL INTESTINE IN DISORDERS OF MALABSORPTION. *(E.)* Duffell, . R. (Northwest Commun. Hosp., Chicago, Ill.). *roc. Inst. Med. Chic.* 30(5):170, 1974.

623 JEJUNAL HYDROLYSIS AND UPTAKE OF CONJUGATED FOLATE IN TROPICAL SPRUE. *(E.)* Halsted, C. H.; Reisenauer, A. M.; Corcino, J. J. (Dep. Med., Univ. California, Davis). *Clin. Res.* 23(3):457A, 1975.

4624 DOMESTIC SPRUE - A DISEASE ENTITIY FREQUENTLY NOT RECOGNIZED. *(Ger.)* Herms, G.; Kramer, G. (Magdeburg-Altstadt Dist. Hosp., Germany). *Z. Gesamte. Inn. Med.* 30(5):178-183, 1975.

4625 WHIPPLE'S DISEASE. CASE REPORT. *(Fr.)* DeWulf, E.; Vielle, G.; Hongque, M. P.; Arianoff, A. A. (St. Elisabeth Clin., Brussels, Belgium). *Acta Gastroenterol. Belg.* 37(4/5):207-224, 1974.

4626 INTESTINAL LIPODYSTROPHY (WHIPPLE'S DISEASE). REPORT OF A CASE WITH NEARLY FATAL OUTCOME. *(Ger.)* Gobel, D. (Richt Hosp., Karlsruhe, Germany). *Leber Magen Darm* 4(3):117-122, 1974.

4627 INCIDENCE OF CELIAC DISEASE IN AUSTRIAN CHILDREN. *(Ger.)* Rossipal, E. (Pediatr. Clin., Univ. Graz, Austria). *Z. Kinderheilkd.* 119 (2):143-149, 1975.

4628 MORPHOLOGICAL AND BIOCHEMICAL CHANGES IN THE SMALL INTESTINAL MUCOSA IN BLIND-LOOP SYNDROME. *(Ger.)* Bloch, R.; Menge, H.; Lorenz-Meyer, H.; Riecken, E. O. (Med. Clin., Univ. Marburg, Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:853-856, 1973.

4629 CHEMISTRY OF WHEAT PROTEINS AND THE NATURE OF THE DAMAGING SUBSTANCES. *(E.)* Evans, D. J.; Patey, A. L. (no affil.). *Clin. Gastroenterol.* 3(1):199-211, 1974.

4630 BARIUM STUDIES. *(E.)* Burrows, F. G. O.; Toye, D. K. M. (no affil.). *Clin. Gastroenterol.* 3(1):91-107, 1974.

4631 CLINICAL AND MORPHOLOGIC RESPONSE TO GLUTEN WITHDRAWAL. *(E.)* Steward, J. S. (no affil.). *Clin. Gastroenterol.* 3(1):109-126, 1974.

4632 THE DISORDER IN CHILDHOOD. *(E.)* McNeish, A. S.; Anderson, C. M. (no affil.). *Clin. Gastroenterol.* 3(1):127-144, 1974.

4633 ELECTRON MICROSCOPY OF JEJUNAL MUCOSA. *(E.)* Shiner, M. (no affil.). *Clin. Gastroenterol.* 3(1):33-53, 1974.

4634 ANAEMIA IN ADULT COELIAC DISEASE. *(E.)* Hoffbrand, A. V. (no affil.). *Clin. Gastroenterol.* 3(1):71-89, 1974.

4635 MORPHOLOGY AND CELL KINETICS OF THE JEJUNAL MUCOSA IN UNTREATED PATIENTS. *(E.)* Watson, A. J.; Wright, N. A. (no affil.). *Clin. Gastroenterol.* 3(1):11-31, 1974.

4636 MALIGNANCY. *(E.)* Stokes, P. L.; Holmes, G. K. T. (no affil.). *Clin. Gastrointerol.* 3(1):159-170, 1974.

4637 ACID MICROCLIMATE IN INTESTINAL ABSORPTION. *(E.)* Blair, J. A.; Matty, A. J. (no affil.). *Clin. Gastroenterol.* 3(1):183-197, 1974.

4638 THE SMALL INTESTINE AT AUTOPSY. *(E.)* Thompson, H. (no affil.). *Clin. Gastroenterol.* 3(1):171-181, 1974.

4639 DERMATITIS HERPETIFORMIS. *(E.)* Fry, L.; Seah, P. P.; Hoffbrand, A. V. (no affil.). *Clin. Gastroenterol.* 3(1):145-157, 1974.

4640 COELIAC DISEASE: IMMUNOLOGY. *(E.)* Asquith, P. (no affil.). *Clin. Gastroenterol.* 3(1):213-234, 1974.

4641 DRUG-INDUCED MALABSORPTION. *(E.)* Longstreth, G. F.; Newcomer, A. D. (Mayo Grad. Sch. Med., Rochester, Minn.). *Mayo Clin. Proc.* 50(5):284-293, 1975.

4642 COELIAC DISEASE IN CHILDHOOD. *(E.)* Wharton, B. A. (Queen Elizabeth Med. Cent., Birmingham, England). *Br. J. Hosp. Med.* 12(4):452-466, 1974.

4643 ADULT CELIAC DISEASE COMPLICATED BY INTESTINAL RETICULUM CELL SARCOMA WITH HIGH SERUM IgA LEVEL. *(E.)* Mussche, M.; Thienpont, L. (Acad. Hosp., State Univ. Ghent, Belgium). *Acta Clin. Belg.* 29(6):388-393, 1974.

4644 LACTOSE AND MILK INTOLERANCE: CLINICAL IMPLICATIONS. *(E.)* Bayless, T. M.; Rothfeld, B.; Massa, C.; Wise, L.; Paige, D.; Bedine, M. S. (Perry Point VA Hosp., Md.). *New Engl. J. Med.* 292(22):1156-1159, 1975.

See also, 4190, 4262, 4407, 5045, 5047, 5049, 5113.

LARGE INTESTINE

4645 NEW TECHNIQUE FOR THE STUDY OF DEFECATION BY MANOMETRY: ITS APPLICATION IN THE DIFFERENTIAL DIAGNOSIS OF MEGARECTUM. *(Fr.)* Hata, Y.; Duhamel, B.; Labarraque, J. P. (Saint-Denis Hosp. Cent., France). *Ann. Chir. Infant.* 15(2):77-86, 1974.

A simple manometric technique was used to visualize the rectoanal inhibitory reflex in 4 normal 3-yr-old children. A balloon-tipped probe was inserted in the barium-filled rectum until the ballon reached the upper portion of the internal sphincter. The balloon was then rapidly inflated while a series of profile X-rays was taken of the seated child. A minimum balloon volume of 10cm^3 was necessary to stimulate opening of the anal canal, which was widest 3-4 sec after stimulation and closed again after 7 sec. A 4-yr-old girl with hypoganglionic megarectum needed a balloon volume of 50cm^3 to open the canal, which then took 10 sec to close. This technique has shown that the internal and external anal sphincters react together, and not sequentially, on dilatation of the rectum. When perfected, it should prove a valuable aid in the differential diagnosis of different types of megarectum.

4646 CEA AS A MONITOR OF GASTROINTESTINAL MALIGNANCY. *(E.)* Holyoke, E. D.; Ming Chu, T.; Murphy, G. P. (Roswell Park Mem. Inst., Buffalo, N. Y.). *Cancer* 35(3):830-836, 1975.

Patients (94) with carcinoma of the colon were studied to determine the reliability of carcinoembryonic antigen (CEA) as a monitor of the malignancy. Determinations of plasma CEA levels were made over a 3-yr period using the Hansen assay, and simultaneous measurements of alkaline phosphatase were made. The CEA levels in 719 of 912 determinations accurately reflected the presence or absence of tumor. The assay detected 47 of 52 clinically clear-cut progressions; the CEA levels rose for 6-14 months in advance of clinical progression. False positive results were encountered in 10% of the patients. CEA levels responded to chemotherapy in close correlation with observed clinical course in the patients with metastatic disease. Initial pretherapy CEA values proved to be good prognostic indicators of disease course following complete resection; an initial CEA value less than 2.5 ng/ml plasma had recurrence of 1 in 120, a CEA greater than 7.0 ng/ml had recurrence of 7 in 9. CEA measurement was found to be as much as twice as sensitive as the alkaline phosphatase test, particularly for metastatic tumor in the liver. The results indicate that CEA can be used as a monitor of patients with colon carcinoma providing its limitations are understood.

4647 METASTATIC CARCINOMA SIMULATING INFLAMMATORY COLITIS. *(E.)* Meyers, M. A.; Oliphant, M.; Teixidor, H.; Weiser, P. (New York Hosp.-

Cornell Univ. Med. Cent., N.Y.). *Am. J. Roentgenol. Radium Ther. Nucl. Med.* 123(1):74-83, 1975.

Cases (12) of metastatic carcinoma which were initially considered as ulcerative or granulomatous colitis clinically and roentgenologically were studied to establish distinguishing features of the malignancies. Characteristic roentgen findings included mucosal thickening, nodular masses, multiple and eccentric strictures, asymmetric involvement, pseudosacculations, spiculations of contour, and frequent associated terminal ileal involvement. Discrete changes and the distribution of colonic involvement distinguished metastatic disease from inflammatory colitis; the specific features were dependent upon pathways of spread, growth characteristics, and local tissue response. Where differentiation is difficult, deep biopsies, histologic documentation or other roentgenographic studies are suggested. Recognition of the characteristic roentgenologic changes is of great clinical importance and leads to a search for the primary neoplasm or establishes the diagnosis of the disease.

4648 MESOCOLIC LYMPH NODE HISTOLOGY IS AN IMPORTANT PROGNOSTIC INDICATOR FOR PATIENTS WITH CARCINOMA OF THE SIGMOID COLON: AN IMMUNOMORPHOLOGIC STUDY. *(E.)* Patt, D. J.; Brynes, R. K.; Vardiman, J. W.; Coppleson, L. W. (Univ. Chicago Hosp. Clin., Ill.). *Cancer* 35(5):1388-1397, 1975.

Histologic changes in human lymph nodes draining adenocarcinomas of the sigmoid colon were evaluated and the prognostic significance of the observed changes were assessed. Cases of adenocarcinoma of the sigmoid colon (36) treated between 1965 and 1968 were studied. Lymph nodes were examined for germinal center activity, sinus histiocytosis, and paracortical activity. Patients whose lymph nodes showed morphological evidence of cell-mediated immunity, either by an increased number of paracortical immunoblasts or sinus histiocytosis, survived significantly longer than those whose lymph nodes showed no such changes. Patients whose lymph nodes showed simultaneous paracortical activity and sinus histiocytosis had the best survival of all. Of that group, 11 of 13 lived 5 yr or more after surgery without signs of recurrent tumor. Germinal center activity was not a significant factor in prognosis. Favorable lymph node histology did not significantly correlate with the modified Duke's classification. The observations support the hypothesis that the immunoblasts observed within the paracortical region of draining lymph nodes are a morphological manifestation of an antitumor T-cell-mediated immune response, and those patients whose lymph nodes have a morphological pattern compatible with a cell-mediated immune response have the best prognosis.

4649 PAPILLARY ADENOMAS OF THE COLON AND RECTUM: A TWELVE-YEAR REVIEW. *(E.)* Jahadi, M. R.; Bailey, W. (Baylor Univ. Med. Cent., Dallas, Tex.). *Dis. Colon Rectum* 18(3):249-253, 1975.

A retrospective study was made to review 12-yr experience with papillary adenomas of the colon and rectum and to evaluate methods of management. Between 1960 and 1972, 185 patients (101 women, 84 men) with papillary adenomas of the colon and rectum were treated; the average age was 63 yr. Of these patients, 40% had rectal bleeding; 71% of the lesions occurred in the rectum and rectosigmoid. The lesions were malignant in 52% of cases; 9% of the patients died with metastatic carcinoma. The 5-yr survival rate was 75%. The results of the study indicate that a conservative approach to the surgical management of papillary adenoma of the colon and rectum should be encouraged, unless the tumor contains or is suspected to contain invasive carcinoma.

4650 APPENDICITIS. A CRITICAL REVIEW OF DIAGNOSIS AND TREATMENT IN 1,000 CASES. *(E.)* Lewis, F. R.; Holcroft, J. W.; Boey, J.; Dunphy, J. E. (San Francisco Gen. Hosp., Calif.). *Arch. Surg.* 110(5):677-684, 1975.

A retrospective analysis was made of 1,000 cases of appendicitis seen from 1963 to 1973 to provide demographic data, to elucidate reliable symptoms, signs, and laboratory studies, and to determine factors affecting morbidity and mortality of appendicitis. The overall negative appendectomy rate was 20%, but it exceeded 40% in women aged 20-40 yr. Nonsurgical lesions were the cause of 2/3 of the negative appendectomies; mesenteric adenitis, gastroenteritis, and abdominal pain of unknown cause accounted for 1/3 of the errors in females and 2/3 in males. Those diseases were best distinguished from appendicitis on the basis of temperature and white blood cell count. The remainder of errors in females were due to pelvic inflammatory disease or other gynecologic problems and were best distinguished from appendicitis on the basis of history and physical findings. The rate of perforation was 21% and the incidence of wound infection was 8.5%. Use of antibiotics did not affect wound infection rate, but they are clearly indicated in perforated appendicitis. Morbidity from appendicitis was primarily due to infection; it was noted that vertical incisions had a significantly higher incidence of infection than right lower quadrant oblique incisions. The authors express the need for improved accuracy in early diagnosis of appendicitis to reduce the rate of unnecessary appendectomy.

4651 ANORECTAL AND COLONIC MANOMETRY: NORMAL AND PATHOLOGICAL MOTOR ACTIVITY. *(Por.)* Habr-Gama, A.; Haberkorn, S.; Gama-Rodrigues, J. J.; Raia, A.; Bettarello, A. (Fac. Med., Univ. Sao Paulo, Brazil). *Arq. Gastroenterol. Sao Paulo* 11(4):201-216, 1974.

Analysis was made of 268 tracings of motor activity in the left colon and rectum (88 cases) or in the anorectal region (180 cases). Colonic manometry was performed on 15 normal controls, five patients with constipation, five with diarrhea, 48 with megacolon due to trypanosomiasis, and 15 with diverticula of the colon. Anorectal tracings were obtained from 15 normal children, 95 with constipation, 30 with congenital megacolon, 20 with malformations of the lumbosacral spine, and 20 patients with megacolon due to trypanosomiasis. Colonic manometry gave the best information on the physiopathology in many of these conditions and served as an aid in selecting methods of treatment. In chronic constipation, colonic motility was increased, suggesting that the use of antispasmodics would facilitate passage of stools. In diarrhea, segmental colonic contractions were decreased, suggesting that anticholinergics, rather than antispasmodics, should be employed. Colonic manometry also demonstrated that diverticula cause increased segmental pressures, primarily in the sigmoid. In uncomplicated forms of diverticulosis and at its onset a high-residue diet facilitates the passage of stools and might prevent the formation of segmental chambers which lead to diverticula. If this conservative therapy fails, sigmoidomyotomy might decrease intraluminal pressures. Megacolon due to trypanosomiasis was accompanied by dyskinesia and absence of the inhibitory reflex at the internal anal sphincter after rectal distention. On the basis of these findings, it is concluded that surgery only improves symptoms by removing the enlarged colon and correcting fecal stasis without having any effect on underlying physiological changes. In children with congenital megacolon, anorectal manometry helps to establish a differential diagnosis between constipation and congenital megacolon, even when the aganglionic segment is very short and a barium enema gives doubtful results. In children with various spinal malformations (sacral agenesis, meningocele, myelomeningocele, and occult spina bifida), anorectal manometry demonstrated whether pressures at the level of the internal anal sphincter were normal and whether this muscle could be used in training these children to develop a normal rhythm of evacuation.

4652 CLINICAL PATTERNS OF ABDOMINAL TUBERCULOSIS. *(E.)* Das, P.; Kumar, P.; Gupta, C. K.; Indrayan, A. (M.L.N. Med. Coll., Allahabad, India). *Am. J. Proctol.* 26(2):75-86, 1975.

To assess the value of various clinical features in the diagnosis of abdominal tuberculosis, 141 cases of abdominal tuberculosis were analyzed clinically and histopathologically. Clinical features were assessed based on the hospital records of the cases admitted between 1967 and 1971. The histological features were determined using 70 specimens obtained from 57 cases. On the basis of the histological examinations, it was difficult to differentiate tuberculous from nonspecific lesions of the bowel. The presence of frank caseation, giant cells, epithelioid cells, and round cells are indicative of tuberculosis, but a microscopic picture similar to a nonspecific type of inflammation may also be present in tuberculous infections of the bowel. In the cases examined, a preoperative clinical diagnosis was given in only 39% of the patients; 8.6% were admitted with acute abdomen and 53.9% were diagnosed with intestinal obstruction. The incidence of the disease increased between 11 and 20 yr of age, peaking between 21 and 30 yr. The female:male ratio was 2.4: 1. The commonest symptoms were generalized pain in and around the umbilical region, vomiting, and constipation; fever, weight loss, and anorexia were also common, and an associated pulmonary lesion was present in 5% of the patients. The most frequent physical signs were abdominal distension, tenderness, and abdominal lumps. Diarrhea was present in 17% of the cases, umbilical fistula in 2.5%, intraperitoneal abscess in 5%, and internal, perianal, and perirectal fistula in none. A diagnostic scoring system involving the allocation of points to parameters such as age, sex, symptoms, duration of symptoms, and signs has been devised; a score of 70 or above (maximum 100) is probably indicative of abdominal tuberculosis.

4653 MEGARECTUM IN CHILDREN: AN ANATOMICAL AND CLINICAL STUDY. *(Fr.)* Hata, Y.; Duhamel, B.; Pages, R.; Poirat, J. B.; Ripault, J. (Saint-Denis Hosp. Cent., France). *Ann. Chir. Infant.* 15(2):65-76, 1974.

Idiopathic megarectum was diagnosed and treated with anorectal sphincteromyectomy in 63 children. None of these patients had megarectum associated with anal imperforation, sacral agenesis, or spina bifida. Biopsies showed either abnormalities in the autonomic innervation of the juxta-anal segment of the rectum (19 cases), structural defects of the internal sphincter (15), or a combination of both abnormalities (19). No morphological abnormalities were detected in 10 cases. A statistical analysis of the date of onset of symptoms suggests that the disease is embryonic in origin. Sphincteromyectomy resulted in a complete cure in 54% of these children, a great improvement in 25%, some improvement in 10%, and no change in 11%. Most of the failures occurred in patients with abnormal innervation, and were later successfully treated with more extensive rectal surgery. The postoperative results were not dependent on age or on clinical or radiological features. This benign and effective method of diagnosis and treatment should be the initial surgical procedure in all patients with megarectum.

4654 AMMONIA AND UREA TRANSPORT BY THE EXCLUDED HUMAN COLON. *(E.)* Bown, R. L.; Gibson, J. A.; Fenton, J. C. B.; Snedden, W.; Clark, M. L.; Sladen, G. E. (St. Batholomew's Hosp., London, England). *Clin. Sci. Mol. Med.* 48(4):279-287, 1975.

Ammonia and urea transport across the colonic mucosa was studied in four subjects who had successfully undergone colonic exclusion for chronic hepatic encephalopathy. The colon was initially cleansed of fecal material and 24 hr later was perfused antiperistaltically with three isosmotic solutions containing 2 g/liter of the nonabsorbed marker polyethylene glycol. The peripheral venous blood was analyzed before perfusion and after the establishment of equilibrium conditions. In some cases, ammonium chloride or urea was added to the perfusion solutions or was infused i.v. Reduction of the luminal pH inhibited the net and unidirectional transport of ammonia from the lumen into the plasma, but the net absorption from high luminal concentrations persisted at low pH. Neither the addition of urea to the perfusate nor i.v. urea infusion produced a consistent increase in the colonic excretion of ammonia in the presence of amonnia-free perfusates. In one subject, i.v. infusion of $[^{15}N]$ ammonium chloride produced rapid labeling of the colonic effluent ammonia, and within 1 hr the specific enrichments of the ammonia in the effluent and in the arterial plasma were approximately equal. During perfusion with nitrogen-free solutions, only small amounts of urea appeared in the effluent, suggesting limited permeability of the colonic mucosa to urea. The results indicate that luminal acidification impairs net ammonia absorption from the colonic lumen and that ammonia either enters the lumen from the plasma or is generated within the lumen from urea or other sources. They also suggest that both ammonia and NH_4^+ diffuse across the colonic mucosa down electrochemical gradients and that the mucosa is considerably more permeable to ammonia than to NH_4^+. Exclusion of the colon appears to abolish the juxtamucosal conversion of urea into ammonia.

4655 RECTAL BIOPSY IN CLINDAMYCIN-ASSOCIATED COLITIS. AN ANALYSIS OF 23 CASES. *(E.)*

Sumner, H. W.; Tedesco, F. J. (Washington Univ. Sch. Med., St. Louis, Mo.). *Arch. Pathol.* 99(5):237-241, 1975.

The findings on rectal biopsy and proctoscope examinations in 23 cases of clindamycin-associated pseudomembranous colitis are summarized. The average age of the patients, 16 of whom were female, was 52 yr. The initial manifestations of colitis were diarrhea and abdominal pain, the average interval between the initiation of clindamycin therapy and onset of symptoms being 8 days. In 14 patients, clindamycin was administered orally (150 mg four times daily), in four it was administered i.v. (300-600 mg four times daily), and in five it was administered by both routes. The interval between the onset of symptoms and complete clinical resolution of the disease averaged 13 days; one patient died after 27 days. Therapy consisted of diphenoxylate hydrochloride with atropine sulfate and general supportive care. Stool cultures showed no growth of staphylococci or other enteric pathogens. On proctoscopic examination, discrete 2-5 mm raised plaques were seen adherent to an edematous, friable mucosa. Rectal biopsy showed pseudomembrane formation and inflammation of the underlying rectal mucosa. Necrosis of the surface epithelium was a frequent finding but no true ulcers were observed. The pseudomembrane was frequently observed to be dislodged from the mucosal surface. Vasculitis or thrombosis was not a feature in any case. Follow-up biopsies in four patients failed to show pseudomembranes and follow-up proctoscopic examinations showed no plaque-like lesions. While the pathologic and proctoscopic features of clindamycin-associated colitis are distinctive in the majority of cases, there are instances in which the disorder could be confused with ulcerative colitis. Proper diagnosis can be aided by awareness of the entity, repeated examinations when necessary, and communication between clinician and pathologist.

4656 BILE ACID EXCRETION AFTER PULL-THROUGH OPERATION FOR HIRSCHSPRUNG'S DISEASE. *(E.)*

Gaze, H.; Murphy, G. M.; Nelson, R.; Corkery, J. J.; Anderson, C. M. (Inst. Child Health, Univ. Birmingham, England). *Arch. Dis. Child.* 50(3):243-245, 1975.

To determine whether altered bile acid metabolism is involved in the production of chronic diarrhea after pull-through surgery for Hirschsprung's disease, the fecal and duodenal bile acids were studied in four patients suffering from diarrhea after such surgery. 3α-dehydrogenase and fluorimetry were used to determine the bile acid concentrations in three 24-hr fecal samples from each patient and in duodenal samples obtained after fasting and after i.v. pancreozymin administration. Fecal fat excretion was also determined, as was the bacterial content of the duodenal and gastric fluids. The fecal bile acids were elevated in all four children who had undergone the Soave pull-through operation in comparison with one child who had undergone colostomy for Hirschsprung's disease and 10 control children. In all five patients, the duodenal bile acid concentrations after pancreozymin stimulation were within normal limits. Bile acid analysis of the 'bile-rich' duodenal fluid obtained after pancreozymin stimulation in three of the pull-through patients indicated a marked reduction in the proportion of deoxycholic acid conjugates. In addition, two of these patients, who also had the highest fecal bile acid levels, showed an elevated ratio of glycine conjugated bile acids to taurine conjugated bile acids in the duodenal aspirate. The fecal fat levels and bacterial flora of the upper small intestine were normal in all cases. The results suggest colonic malabsorption of secondary bile acids in pull-through patients, but indicate that this is probably not the cause of the diarrhea and anal excoriation in these patients.

4657 A DOUBLE-BLIND COMPARISON OF INTENSIVE COURSE 5-FLUOROURACIL BY ORAL VS. INTRAVENOUS ROUTE IN THE TREATMENT OF COLORECTAL CARCINOMA. *(E.)*

Hahn, R. G.; Moertel, C. G.; Schutt, A. J.; Bruckner, H. W. (Mayo Clin. Mayo Found., Rochester, Minn.). *Cancer* 35(4):1031-1035, 1975.

The efficacy of p.o. and i.v. 5-fluorouracil (5-FU) administration in the treatment of colorectal carcinoma was studied using a randomized double-blind procedure. 5-FU was given p.o. (20 mg/kg/day) for 5 days to 47 patients with biopsy-proven metastatic adenocarcinoma of the colon and rectum; an i.v. dose of 13.5 mg/kg/day was given over the same period to 53 similar patients. To determine the effectiveness of the treatments, the patients were reevaluated at 5 and 10 weeks after the initiation of therapy. The blood levels of 5-FU were determined in 19 patients 15, 30, 45, 60, and 120 min posttreatment. There were no significant differences between the i.v.- and p.o.-treated patients in terms of toxic reactions to the drug; the gastrointestinal toxicity and stomatitis seen in each group did not require modification of the dosage and, although severe leukemia occurred in 31% of the patients, there were no drug-related deaths. With regard to the therapeutic results in the two groups, i.v. administration was associated with a nonsignificant increase in overall regression rate and a significant increase in the mean duration of response. Similar results were obtained when both groups of patients were analyzed for specific response of the metastatic hepatic disease. I.v. administration was also associated with a more rapid decline in the 5-FU concentrations in the blood. In addition, while the blood concentration curves were comparable among the different patients receiving i.v., 5-FU, there was a striking variability among different patients receiving the drug p.o. The results suggest that, when indicated, 5-FU therapy is best provided by the i.v. route of administration.

4658 FIBER DEFICIENCY AND COLONIC DISORDERS. *(E.)* Reilly, R. W.; Kirsner, J. B. (Pritzker Sch. Med., Univ. Chicago, Ill.). *Am. J. Clin. Nutr.* 28(3):293-294, 1975.

4659 DIAGNOSIS OF NONSPECIFIC ULCERS OF THE COLON. *(Ger.)* Nuesch, H. J.; Blum, A. L.; Deyhle, P. (Triemli Munic. Hosp., Zurich, Switzerland). *Z. Gastroenterol.* 12(8):625-626, 1974.

4660 HISTOLOGIC CHANGES IN EXCLUDED AND NON-EXCLUDED INTESTINAL LOOPS INSERTED INTO THE URINARY TRACT. *(Cz.)* Kucera, J.; Malinsky, J.; Bana, J. (Med. Fac., Palacky Univ., Olomouc, Czechoslovakia). *Bratisl. Lek. Listy* 61(4):452-461, 1974.

4661 BLEEDING FROM THE LARGE INTESTINE. *(Ger.)* Pichlmayr, R.; Ziegler, H. (Med. Coll., Hannover, Germany). *Langenbecks Arch. Chir.* 337:577-584, 1974.

4662 X-RAY FINDINGS IN PEDIATRIC SURGICAL EMERGENCIES. (6) AGANGLIONOSIS OF THE WHOLE COLON. *(Jpn.)* Matsuyama, S.; Nagashima, K.; Suzuki, N.; Honda, R.; Isshiki, S.; Iwadare, J. (Gunma Univ. Sch. Med., Maebashi, Japan). *Kitakanto Med. J.* 24 (2):129-132, 1974.

4663 RECTAL POTENTIAL DIFFERENCE IN THE DIAGNOSIS OF ALDOSTERONE EXCESS. *(E.)* Beevers, D. G.; Morton, J. J.; Tree, M.; Young, J. (West Infirm., Glasgow, Scotland). *Gut* 16(1):36-41, 1975.

4664 STENOSIS OF THE COLON SECONDARY TO PANCREATITIS: REPORT OF A CASE. *(E.)* Theodoropoulos, G.; Archimandritis, A.; Kalos, A. (Med. Sch., Athens Univ., Greece). *Dis. Colon Rectum* 18 (2):158-160, 1975.

4665 A CASE OF BEHCET'S DISEASE WITH MULTIPLE INTESTINAL ULCERATIONS. *(Ger.)* Lehmann, H.; Stutte, H. J.; Zierott, G.; Schlaak, M. (Med. Clin. I, Univ. Kiel, Germany). *Dtsch. Med. Wochenschr.* 100(7):308-311, 1975.

4666 MAJOR COMPLICATIONS OF COLOSCOPY: BLEEDING AND PERFORATION. *(E.)* Geenen, J. E.; Schmitt, Jr., M. G.; Wu, W. C.; Hogan, W. J. (Racine Med. Clin., Milwaukee, Wis.). *Am. J. Dig. Dis.* 20 (3):231-235, 1975.

4667 INJURIES TO THE RECTUM IN DIAGNOSIS AND THERAPY. *(Ger.)* Decker, H. R.; Filler, D.; Feustel, H. (Surg. Clin., Univ. Erlangen-Nuremberg, Erlangen, Germany). *Munch. Med. Wochenschr.* 117(8):291-292, 1975.

4668 EFFECT OF DRUGS ON MOTILITY OF THE ILEOCECAL SPHINCTER IN ACUTE OBSTRUCTIONS OF THE LARGE INTESTINE. *(Ger.)* Willmen, H. R.; Kogel, H.; Schwilden, E. D. (Med. Fac., Rhenish-Westphalian Eng. Coll., Aachen, Germany). *Int. J. Clin. Pharmacol.* 9(4):314-320, 1974.

4669 INTESTINAL OBSTRUCTION AS A COMPLICATION OF LONG-TERM ANTICOAGULANT THERAPY. *(Fr.)* Sarris, M.; Georgoulis, J.; Gatos, M.; Zervos, S. N. (Hippokrateion Hosp., Athens, Greece). *Schweiz. Med. Wochenschr.* 102(42):1480-1482, 1974.

4670 DIVERTICULOSIS AND DIVERTICULITIS OF THE COLON. *(Fr.)* Girard, M. (no affil.). *J. Med. Lyon* 55(1271):849-861, 1974.

4671 DIVERTICULOSIS OF THE LARGE INTESTINE. CLINICAL STUDY. *(Pol.)* Kaszewska-Jablonska, I.; Górska-Dubowik, M.; Bielecki, M.; Czechlowski, B. (Acad. Med., Gdansk, Poland). *Pol. Tyg. Lek.* 27(48):2105-2107, 1974.

4672 PARENTERAL PRE- AND POSTOPERATIVE TREATMENT OF PATIENTS WITH INTESTINAL FISTULAS. *(Ger.)* Dudziak, R. (Clin., Univ. Frankfurt/Main, Germany). *Langenbecks Arch. Chir.* 337:141-145, 1974.

4673 FISTULAS IN THE SMALL INTESTINE, LARGE INTESTINE AND ANORECTUM. *(Ger.)* Stelzner, F. (Cent. Surg., Univ. Frankfurt/Main, Germany). *Langenbecks Arch. Chir.* 337:131-134, 1974.

4674 THE LOCATION OF ANAL GLANDS IN MAN IN RELATION TO THE CIRCUMFERENCE OF THE ANAL CANAL: THEIR IMPORTANCE IN THE PATHOGENESIS OF ANORECTAL FISTULAS. *(Ger.)* Krakovic, M. (Cent. Surg., Univ. Frankfurt/Main, Germany). *Langenbecks Arch. Chir.* 336(2):141-154, 1974.

4675 A STUDY OF EXPERIMENTAL COLOVESICAL FISTULA. *(E.)* Heiskell, C. A.; Ujiki, G. T.; Beal, J. M. (Northwest. Univ. McGraw Med. Cent., Chicago, Ill.). *Am. J. Surg.* 129(3):316-318, 1975.

4676 COLONOSCOPIC POLYPECTOMY. *(Fr.)* Chabanon, R. (Edouard Herriot Hosp., Lyon, France). *Rev. Fr. Gastroenterol.* (100):53-55, 58, 1974.

4677 ARTERIOGRAPHIC DIAGNOSIS OF A JUVENILE COLON POLYP. *(E.)* Lynch, W. A. (Hartford Hosp., Conn.). *Am. J. Gastroenterol.* 63(2):166-168, 1975.

4678 FAMILIAL POLYPOSIS OF COLON AND RECTUM. *(Ger.)* Hantschmann, N.; Nemsmann, B. (Surg. Clin., Univ. Kiel, Germany). *Dtsch. Med. Wochenschr.* 99(10):453-457, 1974.

4679 GARDNER'S SYNDROME AND FIBROMATOSIS: REVIEW OF THE PROBLEM AND REPORT OF A CASE. *(E.)* Shons, A. R.; Estrin, J.; Najarian, J. S. (Univ. Minnesota Hosp., Minneapolis). *Dis. Colon Rectum* 18(2):128-133, 1975.

4680 LYMPHOID POLYPOSIS OF THE TERMINAL ILEUM AND COLON: A SOURCE OF CLINICAL ERROR. *(E.)* LoGerfo, F. W.; Mueller, R. F. (Dep. Surg., Univ. Maryland, Baltimore). *Am. Surg.* 41(3):179-180, 1975.

4681 ENTEROCOLITIS IN HIRSCHSPRUNG'S DISEASE. *(Dut.)* Lippens, R. J. J.; Van Putten, W. J. (Emma-Pediatr. Hosp., Amsterdam, Netherlands). *Maandschr. Kindergeneeskd.* 41(7/8):239-246, 1973.

4682 GARDNER'S SYNDROME. *(Jpn.)* Tanaka, M.; Hayano, I.; Okubo, T.; Nishioka, K. (Med. Sch., Keio Univ., Japan). *Jpn. J. Clin. Radiol.* (19):781-785, 1974.

4683 PEUTZ-JEGHER'S SYNDROME. *(Ser.)* Jovanovic, B.; Glidzic, V.; Stefanovic, Z. (Med. Fac., Univ. Belgrade, Yugoslavia). *Srp. Arh.* 102(6):479-484, 1974.

4684 CECAL ULCER CAUSED BY CYTOMEGALOVIRUS FOLLOWING KIDNEY TRANSPLANTATION. *(Ger.)* Clavadetscher, P.; Sulser, H.; Linder, E.; Tschen, H.; Deyhle, P. (Dep. Intern. Med., Univ. Zurich, Switzerland). *Z. Gastroenterol.* 12(8):625, 1974.

4685 MUCOPOLYSACCHARIDES IN THE EPITHELIUM OF NORMAL MUCOSA IN THE LARGE INTESTINE AND IN RECTAL AND RECTOSIGMOID CANCER. *(Rus.)* Lazarev, I. M. (Moldavian Res. Inst. Oncol., Kishenev, USSR). *Lab. Delo* (6):335-338, 1974.

4686 PRIMARY CARCINOMA OF THE VERMIFORM APPENDIX. *(E.)* Pendse, A. K.; Dandia, S. D.; Narula, I. M. S.; Ramdeo, I. N. (Sardar Patel Med. Coll., Bikaner, India). *Indian J. Surg.* 36(7):285-286, 1974.

4687 ANTI-TUMOUR IMMUNOREACTIVITY IN COLONIC CARCINOMA. A GUIDE TO EARLY RECOGNITION OF RECURRENCE. *(E.)* Nairn, R. C.; Rollo, A. J.; Nind, A. P. P.; Rolland, J. M.; Guli, E. P.; Pihl, E. A. V.; Stevens, D. P. (Dep. Pathol. Immunol., Monash Univ., Melbourne, Australia). *Aust. NZ J. Med.* 4(6):531-534, 1974.

4688 PREDISPOSING FACTORS IN CARCINOMA OF THE COLON. *(E.)* Sherlock, P.; Lipkin, M.; Winawer, S. J. (Mem. Sloan-Kettering Cancer Cent., New York, N.Y.). *Adv. Intern. Med.* 20:121-150, 1975.

4689 SUTURE-LINE RECURRENCE IN CARCINOMA OF THE COLON AND RECTUM. *(E.)* Labow, S. B.; Salvati, E. P.; Rubin, R. J. (Muhlenberg Hosp., Plainfield, N.J.). *Dis. Colon Rectum* 18(2):123-125, 1975.

4690 IMMUNITY IN COLONIC TUMOR PATIENTS AFTER OPERATION: DETERMINATION BY LEUKOCYTE-MIGRATION INHIBITION. *(E.)* House, A. K.; Wisniewski, S.; Woodlings, T. L. (Perth Med. Cent., Univ. West. Australia, Shenton Park). *Dis. Colon Rectum* 18(2):100-106, 1975.

4691 COMPLETE INVAGINATION OF THE VERMIFORM APPENDIX WITH VILLOUS ADENOMA, INTUSSUSCEPTING TO THE SPLENIC FLEXURE OF THE COLON. *(E.)* Ho, L.; Rosenman, L. D. (Mt. Zion Hosp. Med. Cent., San Francisco, Calif.). *Surgery* 77(4):505-506, 1975.

4692 MALIGNANT TUMORS OF THE ANAL CANAL. *(Fr.)* Stalport, J.; Boddaert, J.; Rase, M.; Quertillier, D.; Toussaint, M. (Reine Astrid Clin., Huy, Belgium). *Acta Gastroenterol. Belg.* 37(6):291-301, 1974.

4693 OBSTRUCTION AND PERFORATION AS COMPLICATIONS OF LARGE BOWEL CANCERS: ISCHEMIC MODIFICATIONS OF THE DISTENDED COLONIC WALL. *(Fr.)* Saegesser, F.; Tabrizian, N. (Univ. Surg. Serv., Lausanne, Switzerland). *J. Med. Strasbourg* 5(4):299-311, 1974.

4694 ADENOCARCINOMA OF THE COLON PRESENTING AS Clostridium septicum CELLULITIS OF THE LEFT THIGH. *(E.)* Poretz, D. M.; Wood, L.; Park, C. (Fairfax Hosp., Falls Church, Va.). *South Med. J.* 67(7):862-864, 1974.

4695 ISCHEMIC LESIONS OF THE DISTENDED COLON. A COMPLICATION OF OBSTRUCTIVE COLORECTAL CANCER. *(E.)* Saegesser, F.; Sandblom, P. (Univ. Laussane Sch. Med., Switzerland). *Am. J. Surg.* 129(3):309-315, 1975.

4696 ANORECTAL MELANOMA. *(E.)* Balthazar, E. J.; Javors, B. (New York Med. Coll., N.Y.). *Am. J. Gastroenterol.* 63(1):79-83, 1975.

4967 UROLOGIC COMPLICATIONS AFTER OPERATIONS FOR ANORECTAL CANCER, WITH AN EVALUATION OF PREOPERATIVE INTRAVENOUS PYELOGRAPHY. *(E.)* Kramhoft, J.; Kronborg, O.; Backer, O. G.; Sprechler, M. (Bispeberg Hosp., Copenhagen, Denmark). *Dis. Colon Rectum* 18(2):118-122, 1975.

4698 PRE-RENAL FAILURE DUE TO VILLOUS ADENOMA OF THE COLON. *(Ger.)* Lange, H. H.; Renner, E. (Cologne-Merheim Munic. Hosp., Germany). *Dtsch. Med. Wochenschr.* 100(6):246-250, 1975.

4699 CARCINOMA OF THE COLON AND RECTUM: ADVANCES IN ITS EPIDEMIOLOGY, ETIOLOGY, AND DIAGNOSIS. *(Ger.)* Feurle, G. (Med. Polyclin., Univ. Heidelberg, Germany). *Med. Welt.* 69(43):1734-1744, 1974.

4700 THE IRRITABLE COLON. A RETROSPECTIVE STUDY OF 217 CASES. *(Ger.)* Ruiz De Aguiar Gonzalez, A.; Audibert Mena, L. (San Carlos Hosp., Madrid, Spain). *Munch. Med. Wochenschr.* 116(38):1641-1646, 1974.

4701 CLINDAMYCIN-ASSOCIATED COLITIS. *(E.)* Unger, J. L.; Penka, W. E.; Lyford, C. (Univ. Kansas Med. Cent., Kansas City). *Am. J. Dig. Dis.* 20(3):214-222, 1975.

4702 CLINDAMYCIN COLITIS FOLLOWING CLINDAMYCIN THERAPY: REPORT OF A CASE. *(E.)* Butsch, J. L.; Al-Humadi, A. H.; Alford, J. E. (Buffalo Gen. Hosp., N.Y.). *Dis. Colon Rectum* 18(2):152-157, 1975.

4703 ISCHEMIC COLITIS WITH PERFORATION INTO THE GALLBLADDER. *(E.)* Wilk, P. J. (Mt. Sinai Hosp., City Univ. New York, N.Y.). *Mt. Sinai J. Med. NY* 42(2):119-126, 1975.

4704 GRANULOMATOUS COLITIS: THERAPY. *(Sp.)* Meeroff, M. (Gregorio Araoz Alfaro Polyclin., Buenos Aires, Argentina). *Galicia Clin.* 45 (10):935-939, 1973.

4705 ISOLATED TUBERCULOSIS OF APPENDIX. *(E.)* Mittal, V. K.; Khanna, S. K.; Gupta, N. M.; Aikat, M. (Postgrad Institute Med. Educ. Res., Chandigarh, India). *Am. Surg.* 41(3):172-174, 1975.

4706 EXAMPLE OF PNEUMATOSIS CYSTOIDES INTESTINALIS. *(Jpn.)* Otawa, K.; Yamasaki, M.; Tashiro, S. (no affil.). *Jpn. J. Clin. Radiol.* (19): 715-721, 1974.

4707 VILLOUS ADENOMA OF THE CECUM. *(E.)* Kilam, S. K.; Costopoulos, L. B.; Yakimets, W. W. (Mem. Univ. Newfoundland, St. John's). *Can. J. Surg.* 18(3):214-215, 218, 1975.

4708 HIRSCHSPRUNG'S DISEASE: ITS AETIOLOGY, PATHOGENESIS AND DIFFERENTIAL DIAGNOSIS. *(E.)* Meier-Ruge, W. (Exp. Pathol. Histochem. Sect., SANDOZ Ltd., Basel, Switzerland). *Curr. Top. Pathol.* 59:131-179, 1974.

See also, 4212, 4236, 4237, 4238, 4239, 4240, 4241, 4243, 4244, 4284, 4395, 4431, 4549, 4579, 4585, 4597, 4721, 4994, 5043, 5084, 5131, 5155, 5156, 5163, 5180, 5185, 5187, 5192.

LARGE INTESTINE

Ulcerative Colitis

4709 EFFECT OF A CHEMICALLY DEFINED LIQUID ELEMENTAL DIET ON COMPOSITION AND VOLUME OF ILEAL FISTULA DRAINAGE. *(E.)* Hill, G. L.; Mair, W. S. J.; Edwards, J. P.; Morgan, D. B.; Goligher, J. C. (Gen. Infirm., Leeds, England). *Gastorenterology* 68 (4):676-682, 1975.

The effect of an elemental diet on the quantity and composition of the ileal fistula drainage was studied in 10 patients with well-established ileostomies. During the first 4 days of the study period, the patients, all of whom were in good health, consumed a "normal" control diet. At the end of this period, the patients were put on a standard elemental diet which supplied the same amount of calories as the control diet. After 8 days on this diet, the patients were put on a 3-day regimen in which 2000 ml of water were taken in addition to the elemental diet. The water content in the feces and ileostomy fluid, the sodium and potassium contents in the urine and ileostomy fluid, and the urinary and ileostomy fluid volumes were measured throughout the study. The mean daily fecal output during the control period was 570 g; during the administration of the elemental diet the fecal output fell to 441 g ($P > 0.02$). In addition the output of sodium in the ileostomy fluid fell from 62.7 to 3.41 mEq ($P > 0.02$) and the output of potassium fell from 5.2 to 2.9 mEq ($P > 0.001$) during administration of the elemental diet, and the concentration of sodium fell from 104.7 to 80.2 mEq/liter ($P > 0.01$). The proportion of water in the ileostomy fluid rose from 90.9 to 94.2% ($P > 0.001$) during this period. When the patients consumed an additional 2 liters of water with the elemental diet, the only significant change observed was a rise in the daily urinary output. The results indicate that under controlled conditions, maintenance on an elemental diet leads to decreases in the gastrointestinal output of fluid, sodium, and potassium, and increases in the water content. These changes were, however, less pronounced than previous reports would suggest.

4710 HERNIATION OF MUCOSAL EPITHELIUM INTO THE SUBMUCOSA IN CHRONIC ULCERATIVE COLITIS. *(E.)* Dyson, J. L. (City Hosp., Nottingham, England). *J. Clin. Pathol.* 28(3):189-194, 1975.

The mechanism of glandular herniation on chronic ulcerative colitis and its relation to carcinoma was studied in 27 patients. They had had colitis from 3-24 yr and 8 had one or more carcinomas. All slides from biopsy specimens in each case were examined. Of 27 cases, 11 showed crypts, cysts, or abscess walls of glandular epithelium in the submucosa. This misplaced epithelium occurred in all parts of the colon, either in islands or as downgrowths continuous with the mucosal glands. When surgery was performed during quiescent periods of ulceration, the mucosal downgrowth was seen usually to occur where the muscularis mucosae had been breached and replaced by a lymphoid aggregate. Slight glandular projection into lymphoid aggregates occurred in almost all cases, but projection into the submucosa was relatively rare. Histological widening of the muscularis mucosae occurred in 8 of 11 patients with mucosal herniation and in 6 with no herniation. There was glandular crowding in 9 cases, 5 of which were associated with herniation. The degree of present inflammation or part ulceration did not bear any relation to herniation. None of the patients with carcinoma had ulcerative colitis for less than 8 yr. Two patients had the disease for 14 and 15 yr, but did not develop carcinoma. Herniation and carcinoma developed independently of each other. It is concluded that herniation is probably due to sustained contraction of the muscularis mucosae, and is not in itself an indication os potential malignancy.

4711 IMPORTANCE OF EARLY INTENSIVE TREATMENT IN SEVERE ATTACKS OF ULCERATIVE COLITIS. *(E.)* Barany, F.; Lindholmer, B. (St. Erik's Hosp., Stockholm, Sweden). *Rend. Gastroenterol.* 6(3): 174-178, 1974.

The clinical course in 41 cases of emergency surgery associated with ulcerative colitis is reviewed to determine whether emergency operations in this disease are avoidable. The first symptoms noted by the patient were slight in 12 cases, moderate in 22, and severe in seven. The mean amount of time elapsed between the onset of symptoms and the first visit to a physician was 18.1 days, while the mean duration between first visit to a doctor and diagnosis and emergency surgery averaged 35.1 days. Among the 41 emergency cases, the diagnosis of ulcerative colitis had been made at an earlier attack in 17 cases, while in 24 cases, surgery was required at the first attack. The data suggest that emergency operations in ulcerative colitis are avoidable if: attacks of this disease are treated immediately upon diagnosis; moderate to severe attacks are treated with high doses of corticosteroids, not sulfasalazine and topical steroids; surgery is performed without delay when a few days of intensive corticoid therapy was not followed by definite improvement of the general condition and bowel inflammation; and anticholinergic and ganglion-blocking agents are avoided during active colitis.

4712 INFLAMMATORY DISEASE OF THE COLON: ULCERATIVE COLITIS AND CROHN'S COLITIS. *(E.)* Ament, M. E. (Univ. California Los Angeles Cent. Health Sci.). *J. Pediatr.* 86(3):322-334, 1975.

4713 NONSPECIFIC ULCERATIVE COLITIS. *(E.)* Pimparkar, B. D. (K.E.M. Hosp., Bombay, India). *Indian Pract.* 27(12):593-603, 1974.

4714 PROTEINS AND GLYCOPROTEINS IN GASTRIC JUICE FROM PATIENTS WITH ULCERATIVE COLITIS. *(Pol.)* Chacaj, W.; Kuczynska-Sekieta, K.; Ceislinska, K.; Malolepszy, J.; Suchnicka, R.; Dec, J. (Acad. Med., Wroclaw, Poland). *Pol. Tyg. Lek.* 29(37): 1579-1531, 1974.

4715 STUDY OF THE LEUKOCYTE AGGLUTINATION REACTION IN PATIENTS WITH NONSPECIFIC ULCERATIVE COLITIS UNDER INPATIENT AND OUTPATIENT CONDITIONS. *(Rus.)* Shakhbazian, A. A. (Erevan Med. Inst., USSR). *Zh. Eksp. Klin. Med.* 14(3):45-50, 1974.

4716 CHANGES IN THE INTESTINAL FLORA IN NONSPECIFIC ULCERATIVE COLITIS. *(Rus.)* Shakhbazian, A. A. (Yerevan Med. Inst., USSR). *Zh. Mikrobiol. Epidemiol. Immunobiol.* (12):108-109, 1975.

4717 EMERGENCY AND URGENT OPERATIONS FOR ULCERATIVE COLITIS. THE PROCEDURE OF CHOICE. *(E.)* Binder, S. C.; Miller, H. H.; Deterling, Jr., R. A. (Tufts Univ. Sch. Med., Boston, Mass.). *Arch. Surg.* 110(3):284-289, 1975.

4718 RECTAL CONSERVATION IN THE SURGICAL TREATMENT OF ULCERATIVE COLITIS. *(E.)* Aylett, S. G. (Westminster Hosp., London, England). *Arch. Fr. Mal. App. Dig.* 63(7):585-587, 1974.

4719 COLECTOMY AND ANASTOMOSIS FOR INFLAMMATORY BOWEL DISEASE. *(E.)* Ritchie, J. K. (St. Mark's Hosp., London, England). *Arch. Fr. Mal. App. Dig.* 63(7):588, 1974.

4720 ILEO-RECTAL ANASTOMOSIS FOR INFLAMMATORY BOWEL DISEASE IN CHILDREN. *(E.)* Nixon, H. H. (Hosp. Sick Child., London, England). *Arch. Fr. Mal. App. Dig.* 63(7):590-591, 1974.

4721 COMPARISON OF BOWEL FUNCTION AFTER ILEORECTAL ANASTOMOSIS FOR ULCERATIVE COLITIS AND COLONIC POLYPOSIS. *(E.)* Newton, C. R.; Baker, W. N. W. (St. Mark's Hosp., London, England). *Arch. Fr. Mal. App. Dig.* 63(7):581-593, 1974.

See also, 4647, 4665, 4953, 5057, 5071, 5160, 5161, 5162, 5165, 5181, 5184.

PANCREAS

4722 FURTHER EVALUATION OF TOTAL PANCREATECTOMY. *(E.)* Pliam, M. B.; ReMine, W. H. (Mayo Clin., Rochester, Minn.). *Arch. Surg.* 110(5):506-512, 1975.

The results of 28 total pancreatectomies performed from 1969-1973 were compared with those of 37 total pancreatectomies performed from 1942-1969. The entire series of 64 patients included 39 men and 25 women, aged 28-77 yr. Among the 40 patients who underwent total pancreatecomy for cancer, 24 had pancreatic carcinoma, 2 islet cell carcinoma, 9 ampullary carcinoma, 3 cystoadenocarcinoma, 1 duodenal carcinoma, and 1 rhabdomyosarcoma. At 6 months, 1 yr, and 3 yr, the survival for the early series was 78, 50, and 17% resp. For the recent series, corresponding rates were 80, 56, and 44%. While not statistically significant, these differences suggest survival rates may be improving over the early series. The difference in survival of cancer and noncancer patients was significant at 1 yr (53 *versus* 83%) and was more striking at 3 yr (25 *versus* 83%). The longest survival was 29 yr 3 months, after total pancreatecomty for islet cell tumor. The longest survival in patients with adenocarcinoma of the pancreas was 6 yr 8 months; in patients with ampullary carcinoma, 6 yr 6 months; in patients with cystadenocarcinoma, 4 yr 9 months; and patients with duodenal carcinoma, 10 months. Of the 5 patients who underwent total pancreatectomy for chronic pancreatitis, the longest survival was 8 yr. In the recent series, wound infection decreased from 33 to 11%, gastrointestinal tract bleeding from 28 to 15%, subphrenic abscess from 20 to 11%, and dumping syndrome from 14 to 7%. The incidence of diabetic ketoacidosis was only 3% for the entire group and did not differ between the early and recent series. However, the frequency of difficult diabetes in the early postoperative period decreased from 25% in the early series to 15% in the recent series. Recognition of the fact that relatively small doses of insulin are necessary to control diabetes in these patients probably accounts for the improvement in management. Major gastrointestinal tract bleeding decreased from 20% to 0 through the use of more extensive gastric resection. These recent results are more favorable than those reported for a group of comparable patients undergoing standard Whipple procedures for malignant lesion at the same institution.

4723 RELATIONSHIP BETWEEN ALCOHOLISM AND PANCREATIC INSUFFIENCY. *(E.)* DiMagno, E. P.; Malagelada, J. R.; Go, V. L. M. (Mayo Clin., Rochester, Minn.). *Ann. NY Acad. Sci.* 252:200-207, 1975.

Basal pancreastic trypsin and lipase outputs in response to a maximal stimulatory dose of cholecystokinin-pancreozymin (CCK-PZ, 0.25 CHR U/kg/min i.v.) were measured in 17 patients (11 men and 6 women, aged 35-71 yr) with chronic alcoholic pancreatitis and in 21 healthy men (aged 21-56 yr). In the controls, maximal CCK-PZ stimulation produced a 2.84-fold increase in lipase output and a 3.5-fold increase in trypsin output over basal levels. No significant increase above basal enzyme levels occurred in chronic pancreatitis. The ratio of lipase to trypsin output in both the basal and stimulatory state was significantly higher in controls than in chronic pancreatitis patients. All 5 patients with a greater than 20-yr history of alcoholism had lipase and trypsin outputs less than 10% of normal maximal values; of the 12 patients with alcoholism of 10-20 yr duration, 11 had below-normal lipase outputs. All patients with greater than 20 yr of alcoholism had pancreatic calcification, steatorrhea, and diabetes. Although 8 patients with a shorter duration of alcoholism had steatorrhea and 7 had diabetes or steatorrhea, only 4 had all of these. The data suggest that lipase secretion is a more reliable predictor of exocrine secretory reserve function than is trypsin secretion and that steatorrhea is a late but inevitable sequel of a progressive decline of pancreatic exocrine enzyme outputs.

4724 SELECTIVE ARTERIOGRAPHY OF THE CELIAC-MESENTERIC ARTERY IN THE DIAGNOSIS AND ASSESSMENT OF OPERABILITY OF PANCREATIC NEOPLASMS. *(It.)* Tateo, R.; Romani, F.; Meinero, M.; Zagnoli, P.; Galasso, U. (Inst. Spec. Pathol. Clin. Propedeut., Univ. Modena, Italy). *Chir. Gastroenterol.* 8(3):300-317, 1974.

4725 ADRENOCORTICAL TISSUE LOCATED IN THE PANCREAS: REPORT OF A CASE. *(It.)* Fortis, P. A.; Longhino, C.; Postiglione, G. (Maggiore, Hosp., Bergamo, Italy). *Osp. Ital. Chir.* 27(1):25-34, 1974.

4726 SURGICAL TREATMENT OF POSTOPERATIVE COMPLICATIONS AND LONG-TERM RESULTS IN PANCREATIC PSEUDOCYSTS. *(Cz.)* Liskova. M. (Dep. Abdom. Thorac. Surg., UVN, Prague, Czechoslovakia). *Rozhl. Chir.* 53(7):454-459, 1974.

4727 ECHOTOMOGRAPHY IN THE DIAGNOSIS OF PANCREATIC PSEUDOCYSTS. *(Fr.)* Levrat, M.; Descos, L.; Pillon, M.; Paliard, P.; Roussille, M.; Duquesnel, C. (Eduoard Herriot Hosp., Lyon, France). *Ann. Gastroenterol. Hepatol. (Paris)* 10(5):367-375, 1974.

4728 PSEUDOCYSTS OF THE PANCREAS. REVIEW OF 71 CASES. *(E.)* van Heerden, J. A.; ReMine, W. H. (Mayo Clin., Rochester, Minn.). *Arch. Surg.* 110(5):500-505, 1975.

4729 PANCREATIC CYST COMPLICATED BY MAJOR ARTERIAL EROSION AND GASTROINTESTINAL HAEMORRHAGE. *(E.)* Wilson, W. F.; Wilkie, R. C.; Ewing, M. R. (R. Melbourne Hosp., Australia). *Aust. NZ J. Surg.* 45(1):85-90, 1975.

4730 ALCOHOL AND THE PANCREAS. *(E.)* Sarles, H. (Dig. Pathol. Res. Unit, INSERM, Marseille, France). *Ann. NY Acad. Sci.* 252:171-182, 1975.

4731 PANCREATOJEJUNOSTOMY IN PANCREATODUODENECTOMY. *(Rus.)* Linchenko, I. F. (Stavropol Med. Inst., USSR). *Vestn. Khir.* 114(3):33-36, 1975.

4732 PANCREATIC TRAUMA. *(E.)* Mosavy, S. H.; Vakshuri, P.; Tadaion, A. (Isfahan Univ. Sch. Med., Iran). *Abdom. Surg.* 17(5):113, 115-116, 1975.

4733 ANATOMOCLINICAL OBSERVATIONS ON TWO CASES OF ABERRANT PANCREAS. *(Rum.)* Popvici, G. I.; Mocanu, A.; Onofrei, T.; Popovici, G. G. (Dep. Surg., United Hosp., Bacau, Rumania). *Rev. Med. Chir.* 78(1):165-168, 1974.

4734 THE STUDY OF PANCREATIC FUNCTION ON ONE CASE OF CYSTIC FIBROSIS. *(Sp.)* Figueroa, C.; Larrain, F.; Danus, O.; Urbina, A. M. (Roberto del Rio Hosp., Santiago, Chile). *Rev. Pediat. Santiago* 17(1/2):7-11, 1974.

4735 EXCRETION OF ZINC IN PANCREATIC JUICE IN THE SECRETIN-PANCREOZYMIN TEST. *(Ger.)* Persigehl, M.; Kasperek, K.; Loffler, A.; Feinendegen, L. E. (Med. Polyclin., Univ. Bonn, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:539-541, 1974.

4736 DISSOCIATION OF PANCREATIC ENZYME SECRETION AND GALLBLADDER EMPTYING AFTER INTRADUODENAL PERFUSION OF CALCIUM. *(Ger.)* Holtermuller, K. H.; Malagelada, J. R.; Go, V. W. L. (Med. Clin., Univ. Mainz, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:537-539, 1974.

See also, 4188, 4199, 4213, 4214, 4233, 4245, 4247, 4248, 4249, 4251, 4252, 4253, 4254, 4256, 4257, 4768, 4920, 4948, 5068, 5094.

PANCREAS

Pancreatitis

4737 CHRONIC CALCIFYING PANCREATITIS IN BRAZIL: MORPHOLOGICAL STUDIES. *(E.)* Nogueria, C. E. D.; Dani, R.; Brandao, H. S.; Nunes, A. (Fac. Med., Univ. Minas Gerais, Belo Horizonte, Brazil). *Rend. Gastroenterol.* 6(3):157-164, 1974.

A morphological study of 38 cases of chronic calcifying pancreatitis showed that the calcifications were diffuse in 33 patients, localized in the head in 4, and localized in the body and tail in 1. Stenosis of the cephalic segment of the duct was observed in all 21 patients submitted to an operative pancreatography; 4 of these patients had a second stenosis in the body and in the tail. Retention cysts were observed in the pancreas of 9 subjects and pseudocysts in 6. Diffuse and heavy induration was grossly present at operation in the 33 patients with diffuse calcifications. In 3 cases with segmental calcifications the fibrosis was more pronounced in the calcified area but was evident in the whole pancreas; in 2 cases with stones in the head of the pancreas, only light sclerosis was seen in the body and the tail. Two patients showed intense edema of the whole pancreas and 15 presented with severe sclerosis of the peripancreatic tissue. The diameter of the common duct, studied in 33 cases by i.v. cholangiography and/or operative radiomanometry, was 0.5-2.3 cm (mean 1.06 ± 0.08). Diffuse portal hypertension was detected in 3 patients and segmentary portal hypertension due to thrombosis of the splenic vein was observed in 1 case. Enlargement of the head of the pancreas was responsible for duodenal obstruction in 3 cases. Microscopic examination of 5 autopsy cases and 19 surgical specimens showed a high incidence of parenchymal atrophy (65%), regression to the canalicular status (70%), islet atrophy (80%), dilation of the ducts (80%), protein plugs (50%), and fibrosis (83%). In 2 patients carcinoma of the pancreas was found 3 and 5 yr after diagnosis of CCP.

4738 PANCREATICO-JEJUNOSTOMY IN CHRONIC PANCREATITIS. AN APPRAISAL OF 29 CASES. *(E.)* Arnesjo, B.; Ihse, I.; Kugelberg, C.; Tylen, U. (Dep. Surg., Univ. Lund, Sweden). *Acta Chir. Scand.* 141: 139-148, 1975.

Pancreatico-jejunostomy (end-to-side after resection of the pancreatic tail or side-to-side following longitudinal cleaving of the pancreatic duct) was performed on 29 patients (22 men and 7 women, aged 14-61 yr) with chronic relapsing or acute relapsing pancreatitis. A follow-up study ranging from 6 months to 10 yr is presented. The patients were allotted to 3 groups according to the severity and extent of the inflammatory involvement at operation. The diagnostic findings obtained at the preoperative evaluation correlated well with these groups. In some patients, however, the inflammatory process was mainly confined to the ductal system, as revealed by pancreatography, while in others the changes were most marked in the parenchyma, as found at histologic examination. Twenty-one caudal pancreatico-jejunostomies and 8 longitudinal anastomoses were performed. Overall results were excellent in 20 patients, good in 6, fair in 3, and poor in none. The rate of postoperative complications was low: no mortality, 1 spontaneously healed anastomosis insufficiency, 2 cases of subphrenic abscess, and 5 cases of postoperative diabetes. Only one patient had a recurrent attack of acute pancreatitis postoperatively. Reanastomosis was successfully performed. It is concluded that pancreatico-jejunosotomy, based on findings at pancreatography, may reduce the risk of serious, late complications of the disease.

4739 EVALUATION OF PROPHYLACTIC ANTIBIOTICS IN ACUTE PANCREATITIS. *(E.)* Howes, R.; Zuidema, G. D.; Cameron, J. L. (John Hopkins Med. Inst., Baltimore, Maryland). *J. Surg. Res.* 18(2):197-200, 1975.

A prospective randomized study was performed to compare the incidence of septic complications in patients with acute pancreatitis treated with antibiotics and in patients receiving no antibiotic therapy. Of 48 patients randomized to the antibiotic group, 44 received ampicillin (1 g every 6 hr for 5 days) and 4 received lincomycin (600 mg i.v. every 8 hr followed by 500 mg p.o. every 6 hr for 5 days). Forty-seven patients received no antibiotic therapy. Age, race, sex distributions were similar within the 2 groups, and in each group alcohol consumption was the most common etiology of the pancreatitis. Average initial serum amylase values were 392 Caraway U/100 ml in the antibiotic group and 365 Caraway U in the no antibiotic group. The amylase level remained elevated for an average of 2 days in both groups. Five septic complications developed in the antibiotic group, and 6 in the untreated group. In the antibiotic group 3 patients developed pneumonia and 2 developed pancreatic abscess. An organism was grown in only 2 of these 5 cases and was an ampicillin-resistant Klebsiella. In the no antibiotic group there were 4 pneumococcal pneumonias, all sensitive to ampicillin, and 1 pancreatic abscess secondary to ampicillin-resistant Klebsiella and Enterobacter. One patient given no antibiotics developed a septicemia, but its source was not found. One patient in the antibiotic group developed an ampicillin allergy and was switched to lincomycin. The overall incidence of septic complications in the two groups did not differ significantly. These results show no advantage of using antibiotics in the treatment of acute pancreatitis until there is clinical or bacteriological evidence of sepsis.

4740 CONSISTENT PROTECTION FROM PANCREATITIS IN CANINE PANCREAS ALLOGRAFTS TREATED WITH 5-FLUOROURACIL. *(E.)* Castellanos, J.; Manifacio, G; Toledo-Pereyra, L. H.; Shatney, C. H.; Lillehei, R. C. (Dep. Surg., Univ. Minnesota, Minneapolis). *J. Surg. Res.* 18(36):305-311, 1975.

The ability of 5-fluorouracil (5-FU) to protect against pancreatitis following pancreas transplantation was studied in 5 groups of adult mongrel dogs. A no-transplant control group (10 dogs) was treated with azathioprine (5.0 mg/kg/day i.v. for 3 days, then 2.5 mg/kg/day p.o) plus 5-FU (15 mg/kg/day i.v. on day 1, then 7.5 mg/kg/day p.o. for 1 week). Control transplanted dogs (6) received no immunosuppressive treatment. Seven transplanted dogs were given azathioprine only; 8 of 14 recipient dogs treated with both azathioprine and 5-FU (15 mg/kg/day the day of the transplant and then 7.5 mg/kg/day for 1 week) received a pancreas from donors treated with 5-FU (15 mg/kg/day) for 2 days and 1 hr before surgery, while the remaining dogs received a pancreas from a donor treated with 5-FU only 1 hr before surgery. Dogs that received no immunsuppression lived an average of 5.5 days. When azathioprine was added to the treatment, survival increased to an average 11.1 days. Only when 5-FU was added to the minimal immunosuppression treatment did the transplanted dogs live for periods up to 4 weeks. Results were best in dogs receiving a pancreas from donors given 5-FU for 2 days before transplantation. The 4 recipient groups did not differ with respect to postoperative total protein, albumin, or blood glucose levels. The postoperative total leukocyte count of untreated recipients was higher than that of the other groups, but the difference was significant only on the 3rd and 4th posttransplant days. Animals treated with azathioprine 8 and 5-FU had significantly lower amylase concentration throughout the posttransplant period, and serum amylase values correlated well with the preservation of the normal architecture of the pancreatic tissue after transplantation. Pancreatitis and peritonitis were present in more than 1/2 the dogs treated with azathioprine alone, whereas there was no case of pancreatitis and a decreased incidence of peritonitis in animals given azathioprine plus 5-FU.

4741 PHOSPHOLIPASE A ACTIVITY IN EFFUSIONS FROM PATIENTS WITH ACUTE PANCREATITIS. *(Fr.)* Thouvenot, J. P.; Durand, S.; Douste-Blazy, L. (Purpan Hosp., Toulouse, France). *Arch. Fr. Mal. App. Dig.* 63(6):479-483, 1974.

By measuring the amount of ^{32}P-phosphatidyl ethanolamine hydrolyzed in the presence of sodium deoxycholate and the absence of trypsin, phospholipase A activities were determined in ascites fluid from five patients with acute pancreatitis and from seven patients with alcoholic cirrhosis and no evidence of pancreatic damage. Results are expressed in nM of ^{32}P-lysophosphatidyl ethanolamine (LPE) liberated by 1 ml of ascites fluid. After 5 min incubation, LPE values ranged from 70 to 815 nmol/ml (mean 330 nmol/ml) in fluid from patients with pancreatitis. The variation in these results is probably due to differences in the severity of the pancreatic lesion and the distance between the foci of inflammation and the peritoneum and does not appear to be caused by enzyme inactivation during the determination or by activation of prophospholipase in the ascites fluid. In two patients, plasma phospholipase activities were lower than those in ascites fluid, suggesting that the enzyme does not originate in the circulatory system. Phospholipase A activities ranged from 25 to 159 nM LPE/ml/5 min (mean 58 nM/ml/5 min) in ascites fluid from cirrhotics). Individual variations in phospholipase A activities in cirrhotics might be due to the chronicity of effusion and absorption of fluid. Student's test demonstrated that for every incubation time employed (5-60 min), phospholipase A activities were significantly higher in ascites fluid from patients with acute pancreatitis than in that from cirrhotics. No lysophospholipase activity was detected in either group.

4742 EPIDEMIOLOGY AND AETIOLOGY OF CHRONIC CALCIFYING PANCREATITIS IN BELO HORIZONTE, BRAZIL. *(E.)* Dani, R.; Nogueira, C. E. D.; Furtado, M.; Leal, S. (Sch. Med., Fed. Univ. Minas Gerais, Belo Horizonte, Brazil). *Rend. Gastroenterol.* 6(3):153-156, 1974.

To determine the frequency and etiology of chronic calcifying pancreatitis (CCP) in Brazil, data from autopsy records and personal cases were compared with findings in healthy controls matched for race, sex, profession, and age. Among 6060 autopsies, diseases of the digestive system were the cause of death in 1205 cases. Of the latter, 256 cases showed pancreatic involvement which was diagnosed as chronic pancreatitis in 13. Thus, the disease occurred in 0.21% of the total cases and in 1.07% of diseases of the digestive system. Of 54 personal cases, 43 (41 men and 2 women) were alcoholic. The difference in age at onset of symptoms between this group and the 11 nonalcoholics (6 women and 5 men) was significant. Moreover, 54.5% of persons with CCP of unknown etiology were aged 6-25 yr, whereas only 1 alcoholic was under 25 yr. Comparison of dietary intake of 27 CCP patients and matched controls revealed that alcohol consumption and carbohydrate and calorie intake were significantly higher in patients than in controls. Protein intake (mainly vegetable proteins) was also significantly higher in the patients. These results do not support the possibility of protein deficiency being a cause of pancreatitis.

4743 CHANGES DUE TO PANCREATIC CYSTS SEEN ON RETROGRADE ENDOSCOPIC CHOLEDOCHO-PANCREATICOGRAMS. *(Ger.)* St. Stender, H.; Seifert, E.; Misaki, E.; Luska, G.; Lesch, P. (Med. Coll., Hannover, Germany). *Fortschr. Gen. Rontgenstr. Nuklearmed.* 120(3):253-258, 1974.

Endoscopic choledocho-pancreaticography (ERCP) was evaluated in the diagnosis of pancreatic disease. This method not only revealed changes in the pancreatic duct due to chronic inflammations and tumors but also demonstrated cysts directly or resultant secondary changes in the pancreatic and bile ducts. Among 612 ERCP's, 10 patients were found with pancreatic cysts. The following signs were characteristic: the cyst may be filled from the pancreatic duct; round void spaces in the contrast agent fillings showing the peripheral ducts and the parenchyma may be due to cysts; the pancreatic duct may be abruptly occluded or be of the tapering type; narrowing or displacement of the intrapancreatic portion of the common bile duct may result from cysts. Distinction between benign and malignant cystic changes in the pancreas is difficult. Following ERCP the patient must be observed carefully for complications due to possible activation of inflammatory processes.

4744 OBSERVATIONS ON ACUTE PANCREATITIS: A POSTMORTEM REVIEW. *(E.)* Gillespie, W. J. (R. Infirm. Edinburgh, Scotland). *J. R. Coll. Surg. Edinb.* 20(1):36-41, 1975.

Postmortem findings in 126 cases of acute pancreatitis (47 men and 79 women) revealed 53 cases of gallstones compared to an expected incidence of 29.95. The stones were in the gallbladder only in 30 cases, in the common bile duct in 16, and were obstructing the ampulla of Vater in 7. Pancreatic abscesses occurred in 14 patients and pseudocysts in 9; fat necrosis was visible to the naked eye in 108 cases. The association between acute pancreatitis and gallstone disease was highly significant and is hypothesized to be the result of the high incidence of gram-negative bacteria associated with cholelithiasis. The frequently focal nature of the pancreatitis is also compatible with an infective origin; in this series, for example, the site of pancreatic disease was in the head alone in 27 cases including 10 subjects with gallstones. Only 3 patients had a history of alcoholism. Despite the increasing accuracy of diagnosis, failure of diagnosis still occurs in acute pancreatitis. The majority of patients are elderly or have multiple preexisting disorders.

4745 MORPHOMETRIC-STATISTICAL ANALYSIS OF PANCREATIC ARTERIES IN CHRONIC PANCREATITIS. *(Ger.)* Kaiser, G.; Hommel, G. (Inst. Pathol., Univ. Erlangen-Nuremberg, Erlangen, Germany). *Virchows Arch.* [*Pathol. Anat.*] 365(2):103-118, 1975.

Changes in pancreatic vessels in chronic pancreatitis and whether the diameter of the arterial vessels is reduced, are statistically examined. Histological preparations from two groups, treated with the van Gieson stain, were used for the investigation: Group I consisted of 50 subjects with healthy pancreatic tissue, and group II of 50 operative cases of chronic pancreatitis. At a 320-fold magnification, media thickness, vessel diameter, and intima thickness of four arterial vessels in each case were determined by a measuring scale in the lens of a light microscope. The test results were transferred to perforated cards and analyzed by computer. Arterial vessels in the endothelium in case of pancreatitis showed cell nuclei projecting into the lumen. Especially remarkable was the thickening of the subendothelial intima tissue in the form in intima-fibrosis and intima-elastosis; atrophy of the media was noted in later stages. The lumen of the arterial vessels seemed to be considerably constricted as compared to that of the venous vessels. The relations between media thickness and vessel radius in both groups were determined and, using regression lines as a model, vessel constriction was found to be statistically significant. Although regression lines for the corresponding thickness were quite close, they were still significantly different. This remaining difference could have been caused by alteration in the media or also by additional influential characteristics that differ in the two test groups. The relation between vessel radius and media thickness was examined with regard to the following variables: distribution of age, sex, and phases of parenchyma reduction. Results show that the differences between the two groups were hardly influenced by age. The different distribution of sex seems to weaken the results more than to intensify it. Finally, the phase of parenchyma reduction corresponds to the extent of vessel alteration. These vessel alterations probably represent an adaption of the reduced parenchyma to the lowered demand for blood. On the other hand, it is rather unlikely that such alteration is an important pathogenetic factor of chronic pancreatitis or a consequence of exterior pressure caused by perifocal inflammation and incisive cicatricial tissue.

4746 THE DIAGNOSIS AND THERAPY OF ACUTE PANCREATITIS. *(Sl.)* Moravec, R.; Chorvat, V.; Bencur, J.; Babala, J.; Lesko, A.; Ohradka, B.; Labas, B. (Med. Fac., Comenius Univ., Bratislava, Czechoslovakia). *Rozhl. Chir.* 53(11):771-779, 1974.

4747 THIRTY-THREE CASES OF NECROTIZING PANCREATITIS TREATED BY PANCREATECTOMY. *(Fr.)* Guivarch, M.; Mouchet, A.; Marquand, J. (no affil.). *Chirurgie* 100(12):891-892, 1974.

4748 THE SURGICAL TREATMENT OF ACUTE PANCREATITIS. *(Rus.)* Shapkin, V. S.; Khorev, G. N.; Sotnichenko, B. A.; Nekhay, K. Kh. (Vladivostok Med. Inst., USSR). *Klin. Khir.* (4):51-56, 1975.

4749 EVALUATION OF SURGICAL METHODS FOR TREATING DESTRUCTIVE FORMS OF ACUTE PANCREATITIS. *(Rus.)* Moroz, I. M. (Lvov Med. Inst., USSR). *Khirurgiia (Mosk.)* 616(3):31-36, 1974.

4750 EXPERIENCE IN COMBINED TREATMENT OF ACUTE PANCREATITIS. *(Rus.)* Postlov, M. P. (Tashkent Med. Inst., USSR). *Khirurgiia (Mosk.)* 616(3): 26-31, 1974.

4751 TREATMENT OF ACUTE PANCREATITIS. *(Fr.)* Hollender, L. F. (Univ. Hosp. Cent., Strasbourg, France). *Lyon Chir.* 71(2):141-144, 1975.

4752 INTENSIVE CARE IN ACUTE PANCREATITIS. *(Ger.)* Pross, E. (Surg. Clin., Univ. Mainz, Germany). *Langerbecks Arch. Chir.* 337(Suppl.):251-257, 1974.

4753 CHANGES IN THE BLOOD CLOTING SYSTEM IN ACUTE PANCREATITIS. *(Rus.)* Moreino, M. S.; Molodenkov, M. N.; Efimov, V. S. (Cent. Inst. Postgrad. Med., Moscow, USSR). *Khirurgiia (Mosk.)* 616(3):36-40, 1974.

4754 EXOCRINE SECRETORY FUNCTION OF THE PANCREAS AFTER ACUTE PANCREATITIS. *(Cz.)* Stastna, R.; Skala, I.; Skala, J.; Zvolankova, K. (Res. Cent. Metabol. Nutr., Prague, Czechoslovakia). *Cesk. Gastroenterol. Vyz.* 28(6):388-396, 1974.

4755 CONTENT OF HIGHER FATTY ACIDS AND TOTAL LIPIDS IN THE SERUM OF PATIENTS WITH ACUTE PANCREATITIS. *(Rus.)* Khomiakov, A. E.; Keda, B. I. (N.I. Pirogov 2nd Moscow Med. Inst., USSR). *Klin. Med. (Mosk.)* 52(11):70-79, 1974.

4756 INFLUENCE OF DIMEDROL AND ε-AMINOCAPROIC ACID ON THE LEVEL OF HISTAMINE AND SEROTONIN IN BLOOD FROM PATIENTS WITH ACUTE CHOLECYSTO-PANCREATITIS. *(Rus.)* Likhachov, V. A.; Bhatta, A. D. (Kharkov Med. Inst., USSR). *Khirurgiia (Mosk.)* 616(3):62-66, 1974.

4757 ACUTE PANCREATITIS COMPLICATING IDIOPATHIC HYPERLIPEMIA. *(E.)* Gabrylelewicz, A.; Kinalska, I. (Med. Acad., Bialystok, Poland). *Mater. Med. Pol.* 6(3):220-222, 1974.

4758 ACUTE HAEMORRHAGIC PANCREATITIS FOLLOWING L-ASPARAGINASE THERAPY IN ACUTE LYMPHOBLASTIC LEUKAEMIA -- A CASE REPORT. *(E.)* Tan, C. L.; Chiang, S. P.; Wee, K. P. (Outram Road Gen. Hosp., Singapore). *Singapore Med. J.* 15(4):278-282, 1974.

4759 RESULTS FROM THE SURGICAL TREATMENT OF CHRONIC PANCREATITIS. *(Ger.)* Lankisch, P. G.; Fuchs, K.; Schmidt, H.; Creutzfeldt, W.; Peiper, H. J. (Med. Clin., Univ. Gottingen, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:552-554, 1974.

4760 THE USE OF RETROGRADE PANCREATOGRAPHY FOR ESTABLISHING INDICATIONS FOR SURGICAL TREATMENT OF CHRONIC PANCREATITIS. *(Ger.)* Manegold, B. C. (Fac. Clin. Med., Univ. Heidelberg, Mannheim, Germany). *Therapiewoche* 24(51):6048-6053, 1974.

4761 THERAPEUTIC METHODS FOR CHRONIC PANCREATITIS. *(Rus.)* Bondar, Z. A.; Tuzhilin, S. A. (I. M. Sechenov 1st Moscow Med. Inst., USSR). *Klin. Med. (Mosk.)* 52(7):32-40, 1974.

4762 COMPENSATORY ABILITIES OF THE PANCREAS IN CHRONIC PANCREATITIS. *(Rus.)* Biagovidov, D. F.; Danilov, M. V.; Karvonidi, P. G.; Raben, N. A. (A. V. Vishnevskii Inst. Surg., Moscow, USSR). *Khirurgiia (Mosk.)* 616(9):62-67, 1974.

4763 CHRONIC RECURRENT PANCREATITIS IN STENOSIS OF THE CELIAC ARTERY. *(Ger.)* Rosellen, E.; Kremer, G. J.; Schnellbacher, E. (Med. Clin., Univ. Mainz, Germany). *Verh. Dtsch. Ges. Inn. Med* 80:550-551, 1974.

4764 MANAGEMENT OF MILD AND SEVERE ALCOHOLIC PANCREATITIS. *(E.)* Kowlessar, O. D. (Jefferson Med. Coll., Thomas Jefferson Univ., Philadelphia, Pa.). *Ann. NY Acad. Sci.* 252:208-213, 1975.

4765 ALCOHOLIC PANCREATITIS. CHRONIC CALCIFYING PANCREATITIS. *(Ger.)* Sarles, H.; Sahel, J. (Res. Unit Gastrointest. Dis., INSERM., Marseille, France). *Verh. Dtsch. Ges. Inn. Med.* 80:1740-1745, 1974.

4766 ALCOHOLISM, ALCOHOLIC PANCREATITIS, AND PANCREATIC SECRETION. *(E.)* Dreiling, D. A. (Mt. Sinai Sch. Med., City Univ. New York, N.Y.). *Ann. NY Acad. Sci.* 252:187-199, 1975.

4767 THE EFFECT OF ALCOHOL ON THE EXOCRINE PANCREAS. *(Ger.)* Goebell, H.; Hotz, J. (Dep. Intern. Med., Univ. Ulm, Germany). *Therapiewoche* 24(51):6040-6046, 1974.

4768 PSEUDOCYST OF THE PANCREAS. EXPERIENCE WITH 70 CASES. *(E.)* Hollender, L. F.; Bur, F.; Marrie, D.; Alexiou, D.; Beaugie, J. M. (Univ. Hosp. Cent., Strasbourg, France). *J. R. Coll. Surg. Edinb.* 20(1):42-48, 1975.

4769 PANCREATIC PSEUDOCYSTS. *(Fr.)* Adloff, M. (Surg. Cent., Univ. Strasbourg, France). *Rev. Med. Liege* 30(1):1-6, 1975.

4770 THE PATHOGENESIS OF PANCREATIC CYSTS AND SURGICAL POLICY FOR THEIR TREATMENT. *(Rus.)* Seniutovich, V. F.; Shevchuk, M. G.; Genyk, S. N. (Ivano-Frankovsk Med. Inst., USSR). *Klin. Khir.* (4):44-46, 1975.

4771 OPERATIONS FOR TWO PANCREATIC PSEUDOCYSTS. *(Rus.)* Petrov, V. I.; Muriev, A. I.; Siniaev, V. P. (S. M. Kirov Mil. Med. Acad., Leningrad, USSR). *Klin. Khir.* (4):62-63, 1975.

4772 THE EFFECT OF OXYTETRACYCLINE ON EXOCRINE PANCREATIC FUNCTION. *(Ger.)* Fleischer, K.; (Med. Clin., Univ. Wurzburg, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:1543-1546, 1974.

4773 EXOCRINE PANCREAS FUNCTION IN OLD AGE. *(Ger.)* Schulz, H. J.; Dietze, F.; Bruschke, G. (German Gerontol. Res. Proj., Humboldt Univ., Berlin). *Dtsch. Gesundheitswes.* 29(45):2126-2129, 1974.

4774 PANCREATIC BIOPSY IN THE DIAGNOSIS OF PANCREATITIS. *(Ger.)* Bader, G. (Rostock-Sudstadt Dist. Hosp., Germany). *Dtsch. Gesundheitswes.* 29(45):2129-2134, 1974.

4775 CHRONIC FORMS OF PLEURISY WHICH ORIGINATE IN THE PANCREAS: THEIR SURGICAL TREATMENT. *(Fr.)* Marland, P.; Bersay, C.; Lacombe, M.; Beaufil, B. (Bichat Hosp., Paris, France). *Poumon Coeur* 30(3):199-206, 1974.

4776 THE RETROGASTRIC TRANSVENTRICULAR APPROACH FOR DRAINAGE OF THE "SUPRAGASTRIC" PANCREATIC PSEUDOCYST. *(E.)* Greenstein, A. J.; Dreiling, D. A. (Mt. Sinai Sch. Med., City Univ. New York, N.Y.). *Am. J. Gastroenterol.* 63(4):312-315, 1975.

4777 ACUTE PANCREATITIS. *(E.)* Trapnell, J. E. (R. Victoria Hosp., Boscombe, England). *Br. J. Hosp. Med.* 12(2):193-203, 1974.

4778 PATTERNS OF INCIDENCE IN ACUTE PANCREATITIS. *(E.)* Trapnell, J. E.; Duncan, E. H. L. (R. Victoria Hosp., Boscombe, England). *Br. Med. J.* 2(5964):179-183, 1975.

4779 PANCREATITIS AFTER RENAL TRANSPLANTATION. *(E.)* Corrodi, P.; Knoblauch, M.; Binswanger, U.; Scholzel, E.; Largiader, F. (Dep. Intern. Med., Univ. Zurich, Switzerland). *Gut* 16(4):285-289, 1975.

See also, 3796, 3992, 4197, 4245, 4246, 4250, 4252, 4253, 4254, 4255, 4664, 4729, 5193.

LIVER AND BILIARY TRACT

4780 POST-JEJUNOILEAL-BYPASS HEPATIC DISEASE. ITS SIMILARITY TO ALCOHOLIC HEPATIC DISEASE. *(E.)* Peters, R. L.; Gay, T.; Reynolds, T. B. (Univ. South. Calif. Sch. Med., Los Angeles). *Am. J. Clin. Pathol.* 63(3):318-331, 1975.

Liver structural changes were followed by serial hepatic biopsies in five patients with hepatic disease following jejunal-bypass for extreme obesity. Three patients were nonalcoholics while two decreased their intake following surgery. Hepatic dysfunction became manifest 2.5-5 months after bypass when weight losses ranged from 65-127 lb. Nausea and vomiting, abdominal pain and hepatomegaly were present in all five while ascites and splenomegaly were detected in three. Laboratory findings, which included hyperbilirubinemia, decreased albumin, prolonged prothrombin time, moderate elevation of alkaline phosphatase and transaminases with the rise in SGOT greater than SGPT, were identical to those seen in acute alcoholic hepatic disease. Hepatic microscopic changes included centrilobular or focal alcoholic hyalin deposition, intrasinusoidal collagenosis, fatty degeneration and neutrophilic infiltration. Four of the five patients died in hepatic failure despite hyperalimentation and re-establishment of intestinal continuity. It is concluded that further study of the mechanism of post-bypass hepatic disease may help in understanding the pathogenesis of alcoholic liver disease.

4781 ARTERIAL INFUSION CHEMOTHERAPY OF HEPATOMA.

(E.) Cady, B.; Oberfield, R. A. (Lahey Clin., Boston, Mass.). *Lahey Clin. Found Bull.* 24 (2):49-55, 1975.

Regional arterial infusion chemotherapy for carcinoma of the liver was used in 18 of 54 patients. Of the remainder, five underwent resection, and the rest, untreated, served as non-concurrent controls. Tumors were graded as well-, moderately-, or poorly differentiated; 17 tumors were classified as liver cell carcinomas and one was classified as cholangiolar. Infusion catheters placed after exploration revealed that the extent of the disease precluded curative hepatic lobectomy. 5-Fluorodeoxyuridine was given in daily doses of 0.3 mg/kg. Occasionally, fluorouracil was used instead, at 3-5 mg/kg/day. Methotrexate was used in one patient (5 mg/kg/day). Treatment was continued as long as catheter and arterial patency could be demonstrated angiographically. Of the 18 patients given infusion, five died as a result. Of these, two died from fibrinolysin production with hemorrhage and pneumonia; one from hemorrhage of esophageal varices, and one from subphrenic abscess and pneumonia, all in the first yr of the program. In the last 5 yr, there was only one treatment related to death. Of 11 males (18-68 yr), median survival rate after elimination of three treatment-related deaths was 16.5 months. Of seven females (12-69 yr), median survival time after elimination of two treatment related deaths was 8 months. Excepting four patients who had no postoperative follow-up, median hepatic arterial patency time was 8.5 weeks. Of 18 patients, 11 were definitely improved, and eight were substantially improved, symptomatically. During the last 5 yr, 10 of 12 were improved, and eight of 12 were substantially improved. Symptomatic improvement was accompanied by a 16.5 month increase in median survival time. Between 1957 and 1962, two patients had resection and 21 no treatment; one survived over 1 yr. Between 1962 and 1965, six patients were given infusion and six no treatment; one survived over six months. After 1966, 12 patients were given infusion, three had resection, and eight had no treatment; 11 survived 6 months, and seven over 1 yr. The difference in survival time between patients not undergoing resection before 1962 and after 1966 is significant. No patient on infusion had all laboratory or clinical features return to normal. It is concluded that hepatic carcinoma may be substantially improved by infusion chemotherapy if resection is not possible.

4782 KINETICS OF RADIOCOPPER IN WILSON'S DISEASE.

(Ger.) Willvonseder, R.; Goldstein, N. P.; Tauxe, W. N. (Mayo Clin. Mayo Found., Rochester, Minn.). *Wien. Z. Inn. Med.* 54(5/6):226-233, 1973.

Plasma incorporation, liver uptake, urinary and fecal excretion, and body retention of i.v. administered ^{64}Cu and ^{67}Cu were examined in 35 homozygous and heterozygous carriers of Wilson's disease, and in a normal control group. Plasma incorporation in heterozygous patients was lower than in normal subjects, and there was practically no incorporation at all in homozygous patients with manifest Wilson's disease. The liver uptake was slightly higher in heterozygous patients than in normal subjects, but it showed steady increase in homozygous patients, and reached extremely high values in the preclinical stages of Wilson's disease. The urinary and fecal excretion was lower in heterozygous patients than in the control group, and the lowest values were found in preclinical stages. The urinary excretion was higher in untreated homozygous patients with manifest Wilson's disease than in heterozygous patients and in the control group, while the fecal excretion was practically zero in the former group. The mean biological half-life period of ^{64}Cu was determined to be 17 days in the control group, 39.4 days in heterozygous patients, and 97 days in homozygous untreated patients. The results indicate that copper is not bound to ceruloplasmin in patients with Wilson's disease. The liver copper uptake mechanism is still compensated in preclinical stages, but it is decompensated in clinical stages of Wilson's disease. Due to their high discriminatory efficiency, radiocopper investigations are recommended in all patients suspected of an error in copper metabolism.

4783 PRIMARY ANGIOSARCOMA OF THE LIVER. REVIEW ARTICLE.

(E.) Alrenga, D. P. (Hektoen Inst. Med. Res., Chicago, Ill.). *Int. Surg.* 60(4): 198-203, 1975.

The characteristics of primary angiosarcoma of the liver are reviewed for both the adult and infantile forms. The disease formed 1.8% of all primary liver cancers in a review of the literature between 1954 and 1974, and had an autopsy incidence of 6/100,000. There was no geographic variation in incidence. The most common etiologic agent was thorium dioxide, responsible for at least 50 cases since 1947. Angiosarcoma comprised over 1/3 of all thorium dioxide-induced malignancies: eight cases of angiosarcoma in 28 cases of postnecrotic necrosis induced by arsenic trioxide; one caused by γ-radiation from a radium needle lodged in the heart; and one in a patient treated for 17 yr with arsenic for psoriasis. There were about 20 deaths attributed to vinyl chloride-induced angiosarcoma. Clinically, 15% of the patients were under 40 yr of age, and males predominated 2:1 over females. The commonest symptoms were rapid hepatic enlargement with epigastric pain, ascites (often hemorrhagic), and jaundice, although the mode of presentation was quite variable in general. Infantile hemangioendothelioma occurred in children under 4 yr of age; 70% were diagnosed before 6 months of age. Hepatomegaly was the only consistent finding on physical examination. Abdominal distension, vomiting, diarrhea, or constipation were the most common symptoms. Gross morphology of both angiosarcoma and infantile hemangiendothelioma were very similar. Tumors were solitary, multicentric, or diffuse, and varied from fleshy nodular masses to large blood filled cycts. Histopathologically, angiosarcoma, as opposed to the infantile form, had more nuclear atypia, mitotic activity, and giant cell formation. The most distinguishing feature was the presence of intercommunicating spaces lined by atypical endothelial cells confined within a thin reticulin network. Unique microscopic features also included neoplastic cells simulating Kupffer cells, extramedullary hemopoeisis within the tumor's vascular spaces, and ability of the tumor cells to ingest hemosiderin. The histologic pattern of the infantile form showed either vascular spaces lined by plump endothelial cells and separated by collagenous and myxoid stroma, or poorly formed vascular spaces with large pleomorphic endothelial cells and extramedullary hemopoeisis. Adult angiosarcoma was commonly associated with fibrosis or cirrhosis and the infantile forms with cutaneous hemangioma. Angiosarcoma had an unfavorable prognosis, while the infantile form had a more favorable one, with a 50% survival rate.

4784 EXCHANGE TRANSFUSION FOR REYE'S SYNDROME.

(E.) Lewis, J. D.; Varma, R. R.; Harrington, G.; Caspar, J.; Ackamnn, J. J.; Darin, J. C. (Med. Coll. Wisconsin, Milwaukee). *J. Surg. Res.* 18(3):327-329, 1975.

Patients with Reye's syndrome, all in grade IV-V coma, were treated by exchange transfusion. Blood components were used for more efficient use of resources. Packed blood cells were washed with saline and combined with fresh-frozen citrate-phosphate-dextrose plasma. Cerebral edema was treated by administration of dexamethasone and mannitol, and the colon was "sterilized" with neomycin p.o. and *via* enema and fructose *via* enema. A total of 21 exchanges were performed on the nine patients. One patient responsed rapidly to one exchange. Six required two exchanges; five of these responded. Two required four exchanges before response. One patient was given peritoneal dialysis. Computerization of EEG activity showed significant diminution of delta activity with associated increase in theta and alpha activity in those treated by exchange transfusion, but not in the patient undergoing dialysis, until exchange transfusion had reversed the clinical course. It is concluded that exchange transfusion is extremely effective in the treatment of profound Reye's syndrome.

4785 'PURE' HEPATIC FORMS OF WILSON'S DISEASE IN CHILDREN: TEN OBSERVATIONS.

(Fr.) Odievre, M.; Vedrenne, J.; Landrieu, P.; Alagille, D. (Parrot Hosp., Bicetre, France). *Arch. Fr. Pediatr.* 31(2/3):215-222, 1974.

Observations of 10 cases of Wilson's disease in children are presented. In all cases, the involvement was predominantly or exclusively hepatic and included cirrhosis (nine cases), intrahepatic portal hypertension (three), chronic active hepatitis (nine), and acute anemia and hepatocytic insufficiency due to acute transitory hemolysis (five cases, fatal in four). In one case, Wilson's disease was diagnosed by systematic examination following the deaths of two siblings from acute hemolysis and hepatocytic insufficiency caused by Wilson's disease. The clinical and biological polymorphism of Wilson's disease makes diagnosis difficult. The authors suggest that certain features of hepatic involvement are indicative of a metabolic origin: parallel decrease in the different factors of the prothrombic complex; coexistence of hepatic symptoms with signs of renal tubular involvement; association of hepatic portal fibrosis with steatosis; hepatic cytolysis; and normal levels of α_2-globulins associated with other hepatic symptoms. Definitive diagnosis is demonstrated by ceruloplasmin concentration below 200 mg/liter, plasma copper concentration below 60 µg/100 ml, and cupruria greater than 100 µg/24 hr. It is concluded that an elevated concentration of hepatic copper resolves diagnosis in doubtful cases.

4786 SPECTRUM OF LIVER DISEASE IN RENAL TRANSPLANT RECIPIENTS.

(E.) Ware, A. J.; Luby, J. P.; Eigenbrodt, E. H.; Long, D. L.; Hull, A. R. (Univ. Texas Southwest. Med. Sch., Dallas, Texas). *Gastroenterology* 68(4):755-764, 1975.

Renal transplant patients over a 4 yr period were reviewed with an attempt to define episodes of liver disease in these patients in terms of their nature, etiology and prognosis. There were 82 patients at risk in development of liver disease. They were observed for 6 months to 4 yr, during which time they were frequently assessed for hepatic dysfunction clinically and by laboratory tests including serum bilirubin, serum alkaline phosphatase, and SGOT. Determination of the hepatitis B surface antigen (HB_sAg) were performed monthly, and at least one serum sample from each patient was assayed by solid phase radioimmunoassay, and cytomegalovirus (CMV) antibody was assayed by complement fixation. CMV was also assayed by innoculation of cultured cells with samples of urine or homogenized liver. The minimum criteria for liver disease were two consecutive elevated SGOT levels, 1 week apart. Of the 82 patients, 31 (38%) developed evidence of liver disease after the transplant. Of these, eight cases were acute, self limited, reversible, and benign; two were acute, and fatal hepatitis, and 21 were a form of chronic disease with cirrhotic potential. The development of the disease was not influenced by age, sex, nature of the kidney disorder, source of donor, quality of HLA tissue match, or the dosage of azathioprine and steroid therapy given to all patients. Of the 31 cases, 25 began within 6 months of transplantation. The eight cases of reversible disease lasted from 1-20 weeks. A biopsy performed in one case showed multiple fresh granulomata. Typical CMV inclusions were found in enlarged and degenerating hepatocytes. HB Ag was not present in any case. In six of the cases, there was seroconversion to CMV within a few weeks of the disease's onset, and CMV was found in the urine in three cases. Of the two patients with acute fatal disease, one was HB$_s$Ag positive. The other was negative, but CMV seroconversion coincided with the onset of the illness. Of the 21 patients with chronic disease, 16 underwent seroconversion to CMV. Follow-ups of from 6-40 months showed constant liver function test results. In three patients, there were five episodes of acute reversible icterus, probably etiologically unrelated. Three of the 21 patients had persistent HB$_s$Ag antigenimia. One of these, however, was positive for HB$_s$Ag for 2 1/2 yr before any abnormality of liver function was detected. It is suggested that CMV was a likely cause for a majority of the cases, while hepatitis B may have been implicated in a few, but the results are not conclusive.

4787 INVESTIGATION OF THE HEPATIC CATALASE ACTIVITY IN PATIENTS WITH MALIGNANT TUMORS AND FATTY LIVER. *(Ger.)* Guelzow, M.; Falkenhagen, D.; Huetter, J.; Arendt, R.; Teichmann, W. (Fac. Med., Univ. Rostock, Germany). *Z. Inn. Med.* 29(23): 959-964, 1974.

The liver catalase activity was determined by manometry in biopsy specimens from 32 normal subjects, 31 patients with malignant tumors of different localizations, and in 25 patients with fatty liver to establish the relation between the catalase activity and the pathological state. The liver catalase activity was highest with 13.29 IU/mg in normal subjects, and significantly lower in tumor patients, and especially in patients with moderate and serious fatty liver. The catalase activity was lowest in patients with serious degree of fatty liver, being significantly lower than in patients with moderate degree of fatty liver. The catalase activity, while not age-dependent, was highest in the 51-70 yr age group. No significant sex-conditioned difference was established. The difference between tumor patients with and without metastases was insignificant.

4788 HEPATIC ARTERY LIGATION AND CYTOTOXIC INFUSION IN TREATMENT OF LIVER NEOPLASMS. *(E.)* Zike, W. L.; Safaie-Shirazi, S.; Gulesserian, H. P. (Univ. Iowa Hosp., Iowa City). *Arch. Surg.* 110(5):641-643, 1975.

Hepatic artery ligation with distal infusion of the artery with cytotoxic drugs was used to treat 38 patients with primary or secondary hepatic neoplasms. None showed evidence of major extrahepatic metastases. Laparotomy was performed, the primary tumor was resected whenever possible, and the hepatic artery ligated distal to its extrahepatic branches. A catheter was inserted distal to the ligation and was ligated to the artery at two or more sites. The lesser omentum, falciform ligament, and triangular ligament were transected and the gallbladder removeed. The catheter was kept open by constant infusion of saline and heparin solution, and when liver enzymes returned to preoperative levels, patients were infused with 12 mg/kg/day fluorouracil in heparinized saline. Treatment was discontinued when the catheter became displaced, became clogged by clotting, or when drug toxicity appeared. The average fluorouracil infusion lasted 45 days. The median survival time was 13.3 months; the longest survival was up to 44 months. Of the eight surviving patients, median survival time was 17 months. The primary tumor was in the large bowel in 25 patients, and in the liver in five. Of the 38, three had ligation only, with no infusion. There were marked postoperative elevations in alkaline phosphatase, SGOT, and LDH. Values returned to normal within 8 days. It is concluded that this method does not destroy the entire tumor, but does result in substantial palliation with minimal morbidity and mortality.

4789 THE DIAGNOSIS OF JAUNDICE BY THE MINI-LAPAROTOMY OPEN TRANSHEPATIC CHOLANGIOGRAM. *(E.)* Stein, H. D. (Lincoln Hosp., Bronx, N.Y.). *Ann. Surg.* 181(4):386-389, 1975.

Diagnosis of the etiology of obstructive jaundice was made by open transhepatic cholangiography (minilaparotomy) in 23 patients. Routine diagnostic procedures had failed in all. Five had ascites and four had elevated prothrombin levels. The liver was visualized through a 4 cm subxiphoid incision using local anesthesia. The catheter was inserted and contrast material injected into a bile duct under fluoroscopic control. Cholangiograms were attempted in all cases. Liver biopsies and cultures of bile and ascitic fluid were obtained when necessary. The procedure resulted in successful diagnosis in 21 of the 23 patients. In one unsuccessful case the cholangiogram was unsuccessful and surgery resulted in a diagnosis of intrahepatic cholestasis secondary to Gold therapy. In the other case, cholangiography showed obstruction of the common hepatic duct, but surgery disclosed carcinoma of the pancreas. Cholangiography was unsuccessful in two other patients in whom the procedure was attempted only perfunctorily because diagnosis was already evident by direct observation and biopsy. Of eight patients in whom non-surgical disease was diagnosed or diagnosis was in question, five had cholelithiasis. In the other three, precise diagnosis was changed but therapy was not. In 14 cases with high probability of surgical disease, three were saved surgery and clinical diagnosis was proved incorrect in four. There were no wound complications, bile leaks or hemorrhage, and future surgery was not interfered with in any patient. It is concluded that minilaparotomy is safe and reliable, and has a nearly 100% accuracy, low complication rate, and minimal limitations of use.

4790 HEPATIC CELL ADENOMAS, SPONTANEOUS LIVER RUPTURE, AND ORAL CONTRACEPTIVES. *(E.)* Ameriks, J. A.; Thompson, N. W.; Frey, C. F.; Appelman, H. D.; Walter, J. F. (Univ. Michigan Med. Cent., Ann Arbor). *Arch. Surg.* 110(5):548-557, 1975.

The clinical and pathological features of hepatic cell adenoma were studied in eight patients. All were women, aged 25-44 yr; all had been taking oral contaceptives containing a progestogen and estrogen combination, from 6 months to 9 yr, and all but one had been at least twice pregnant before starting the drug. Average tumor size was 15 cm in diameter, but in three cases where the tumors ruptured, they were 18 cm in diameter. There was no correlation found between tumor size, clinical presentation, age, or duration of drug use. The three patients with ruptured tumors were treated by anatomical right lobectomy, and despite complications in each case, all survived and were followed up for 8 months to 3 yr. Two patients had expanding neoplasms which were excised with a rim of normal tissue. Both recovered with no significant morbidity. Three patients had asymptomatic neoplasms. Two of these were treated by excision with a rim of normal tissue, while the third was given an anatomical right lobectomy. All were well at follow-ups of 5 months, 3 yr, and 5 yr. All tumors consisted of well differentiated hepatocytes organized into sheets and cords, but without lobules, and were partly encapsulated by an incomplete fibrous membrane. It is suggested that there may be a relation between these tumors and oral contraceptives.

4791 LIVER IMPAIRMENT DURING CHRONIC HEMODIALYSIS AND AFTER RENAL TRANSPLANTATION.

(E.) Nielsen, V.; Clausen, E.; Ranek, L. (Rigshosp., Copenhagen, Dnemark). *Acta Med. Scand.* 197(3):229-234, 1975.

The possible causes of aminotransferase elevation were elevated in patients treated with chronic hemodialysis and renal transplantation. Patients were treated with hemodialysis alone (23), hemodialysis and renal transplantation (37), or allotransplantation alone (19). Of the last, 12 had had previous hemodialysis treatment. Tests of serum alanine aminotransferase, prothrombin-proconvertin, and serum protein electrophoresis were done at least four times/month. Clinically, biochemically, and histologically, the patients were divided into five groups: 1) no clinical or biochemical evidence of liver disease; 2) elevated alanine aminotransferases, but no clinical evidence of disease; 3) anicteric hepatitis; 4) icteric hepatitis; and 5) elevated alanine aminotransferases possibly not due to viral hepatitis. Of the 60 patients given hemodialysis, 29 showed no liver disease, nine had transferase elevation, five had anicteric hepatitis, and 10 had icteric hepatitis. A final group consisted of seven patients in whom elevated alanine aminotransferase values were assumed to be due to bacterial sepsis in two, crush syndrome with anuria in two, iron contamination of dialysis water in one, cardiac arrest in one, and severe hemosiderosis of the liver in one. There was no significant rise in cytomegalovirus (CMV) titers in any. Of the 56 patients given renal allotransplants, 28 showed no liver impairment, nine had asymptomatic transferase elevation, 10 had anicteric hepatitis and four had icteric hepatitis. A final group consisted of five patients in whom elevated transferase values were assumed to be due to polycystic kidneys and liver cysts in one, urinary leakage and urinary tract infection in three, and hemosiderosis of the liver in one. CMV titers did not rise significantly in any. In all, 50% of the hemodialysis patients and 50% of the renal transplant patients had elevated transferase levels for longer or shorter periods, while the mortality from hepatitis was 13%. It is concluded that alanine aminotransferase elevation is not a contraindication for performing renal transplant.

4792 INFECTIOUS HEPATIC GRANULOMATOSIS: CLINICAL ASPECTS AND LIVER FUNCTION TESTS.

(Sp.) Hernandez Guio, C.; Rey, R.; Aguirre, M.; Dominguez, A.; Patino, J. (Jimenez Diaz Found., Madrid, Spain). *Rev. Clin. Esp.* 133(1):39-44, 1974.

Of 33 patients with hepatic granulomatosis associated with infectious disease, 12 had tuberculosis, six brucellosis, and 15 leprosy. In four patients with tuberculosis, the liver was the only organ involved; cirrhosis was present in three patients with tuberculosis. Specific granulomatous lesions were found in all 28 patients from whom liver biopsies were taken. In general, symptoms were suggestive of granulomatous hepatitis. Fevers were present in all 12 patients with tuberculosis, in five of those with brucellosis, and in one with leprosy; seven other patients with leprosy ran fevers intermittently. Jaundice was present in seven of those with tuberculosis, in one with brucellosis and, intermittently, in seven with leprosy. Hepatomegaly was observed in 10 patients with tuberculosis, six with brucellosis, and 13 with leprosy. Splenomegaly was present in half of those with leprosy and tuberculosis and in four with brucellosis. Of the liver function tests performed, serum protein fractions exhibited the greatest changes in all three groups of patients. The most specific changes were noted in leprosy, probably as a result of immunological disorders. Turbidity tests were positive, but are considered nonspecific. SGOT values were pathological in four patients with tuberculosis and three with leprosy, suggesting the presence of parenchymal damage. However, none of these patients had histological evidence of cirrhosis. Serum alkaline phosphatase and BSP retention values are considered useful indicators of liver function in afebrile and nonjaundiced patients, resp. However, liver biopsies were the most valuable diagnostic tool. Although leprosy had been diagnosed in 14 patients before liver biopsies were taken, the etiology of hepatic granulomatosis was established only by liver biopsy in almost half of these patients.

4793 THE EFFECTS OF AGE AND LIVER DISEASE ON THE DISPOSITION AND ELIMINATION OF DIAZEPAM IN ADULT MAN.

(E.) Klotz, U.; Avant, G. R.; Hoyumpa, A.; Schenker, S.; Wilkinson, G. R. (Vanderbilt Univ. Sch. Med., Nashville, Tenn.). *J. Clin. Invest.* 55(2):347-359, 1975.

The disposition and elimination of diazepam were studied in 21 patients with liver disease and in 33 healthy adults aged 15-82 yr. In healthy subjects, plasma diazepam concentration, as determined by gas chromatography, declined biexponentially with a clearance value of 20-32 ml/min following p.o. (10 mg) or i.v. (0.1 mg/kg) administration. Although clearance was not age-dependent, analysis of the i.v. data according to a two-compartment open model indicated that both the initial distribution space and the steady state volume distribution of diazepam increased linearly with age. The increase in the steady state volume distribution was secondary to a change in the initial distribution space. Plasma half-life of desmethyldiazepam, the metabolite of diazepam, showed a similar age dependence although its peak concentration was lower and occurred later than the precursor. Both compounds bound extensively (97%) to plasma proteins. Patients with cirrhosis had a two-fold longer diazepan half-life (105.6 hr) than age-matched controls (46.6 hr) due primarily to similar decrease in total plasma clearance. Appearance of plasma desmethyldiazepam was delayed 3-8 hr compared to controls. Plasma diazepam clearance was also prolonged about two-fold in patients with acute viral and chronic active hepatitis. In cirrhotic and viral hepatitic patients, no correlation was found between plasma half-life or clearance and any of the routine liver function tests. It is concluded that: 1) diazepam plasma concentrations will not accumulate to a greater extent in older than in younger patients, thus making dosage modifications unnecessary; and 2) reduced drug clearance dictates the use of caution in prescribing diazepam to patients with acute or chronic liver disease.

4794 A STAGING SYSTEM FOR HEPATOCELLULAR CARCINOMA: PROGNOSTIC FACTORS IN UGANDIAN PATIENTS.

(E.) Primack, A.; Vogel, C. L.; Kyalwazi, S. K.; Ziegler, J. L.; Simon, R.; Anthony, P. P. (Uganda Cancer Inst., Kampala). *Cancer* 35(5):1357-1364, 1975.

A functional-anatomical staging system for hepatocellular carcinoma was studied for its prognostic significance. Historical, clinical, and laboratory aspects of the scheme were examined in 72 untreated patients with hepatocellular carcinoma. The median survival for the group was 1 month. The presence of a serum bilirubin concentration of greater than 2 mg/100 ml or weight loss greater than 25% of body weight were the poorest prognostic features. Other factors having prognostic significance were visible abdominal collateral circulation, ascites, tumor differentiation, and elevated serum levels of alkaline phosphatase, SGOT, α-fetoprotein, and proline hydroxylase. Analysis of prognostic factors suggested a modification and simplification of the staging classification devised at an International Symposium on Liver Cancer in Kampala; three prognostically different groups of Ugandan patients were defined. The authors suggest that the staging scheme presented serve as a frame of reference for comparison of prognostic features in different populations of patients with hepatocellular carcinoma.

4795 HISTOLOGICAL CHANGES IN LIVER BIOPSIES OBTAINED AT THE TIME OF INTESTINAL BYPASS PROCEDURES FOR MORBID OBESITY.

(E.) Krantz, B. E.; Schenken, J. R.; Swenson, S. A.; Vickstrom, D.; Pumphrey, H. (Univ. Nebraska Sch. Med., Omaha). *Nebr. Med. J.* 59(9):347-350, 1974.

Liver biopsies were performed in 46 patients undergoing jejunocolic bypass and on 107 patients undergoing jejunoileal bypass for morbid obesity (203-470 lb) or for complications of previous bypass procedures. Of 112 biopsies obtained at the time of primary bypass, 76% showed some degree of fatty change. Of 38 having a secondary bypass, 84% showed fatty liver. The majority of biopsies also had evidence of chronic portal or parenchymal inflammation, usually mild. Focal acute hepatitis, epithelioid granulomas and periportal fibrosis were evident in a few cases. In general, these changes were more commonly seen in patients following jejunocolic bypass. Histologic changes had usually progressed in 17 patients from whom liver biopsies had been obtained at the time of primary bypass and again during a second procedure 5 to 51 months later. It is concluded that liver biopsy should constitute an essential part of the prebypass evaluation of patients with morbid obesity.

4796 IMMUNOFLUORESCENT AUTOANTIBODY STUDIES IN THE DIAGNOSIS OF CHRONIC LIVER DISORDERS.

(E.) Doniach, D. (Middlesex Hosp. Med. Sch., London, England). *Rend. Gastroenterol.* 6(3):192-203, 1974.

Serum antibodies detected by immunofluorescence are reviewed in relation to differential diagnosis in chronic liver disease. The incidence of antinuclea antibodies (ANA) is highest in lupoid hepatitis, bu the ANA test is positive in 70-80% of patients with chronic active hepatitis (CAH) when Australia antigen-positive cases are excluded. The staining pattern is usually diffuse in CAH as opposed to speckled or nucleolar in primary biliary cirrhosis (PBC) and cryptogenic cirrhosis. Smooth muscle-related antibodies (SMA) are specific for CAH only if titer are greater than 80. Mitochondrial antibodies (AMA) are detected in 84-96% of patients with PBC; titers are high (200-6000) in about 1/2 the patient and moderate or low in the remaining. Liver/kidney microsomal antibodies (LKM) show a striking correlation with a form of CAH: the patients tend to be young and many progress to cirrhosis. Clinical and serological features are shown for six subgroups of CAH, the largest of which shows none of the serological markers. The other groups are Australia antigen-related (virus B), drug-induced, lupoid, PBC-related, and LKM-associated. Patients with lupoid hepatitis are mostly female and have SMA in addition to high titer ANA. The PBC-related cases are seen in much older women. Striking features of the LKM-associated cases are the lower frequency of ANA and SMA, the high proportion of males and the defined icteric onset. All forms of acute hepatitis are associated with a high incidence of SMA, which disappear on recovery; ANA, AMA, and LKM reactions are rare and/or transient. Australia antigen tests are usually negative in lupoid and PBC-related CAH. Post-operative jaundice associated with halothane anesthesia is associated with a 100-fold increase in LKM. It is concluded that the serum antibodies detected in liver diseases are probably not responsible for destruction of hepatocytes but can be considered markers of other underlying pathogenic processes. Their constant presence only in certain types of disease suggests that they are not an epiphenomenon.

4797 SUBSTRATE INCORPORATION INTO HEPATIC LIPIDS AND PROTEINS IN VITRO IN PATIENTS WITH PRE-β HYPERLIPOPROTEINEMIA. *(E.)* Stakeberg, H.; Schersten, T. (Sahlgrenska Hosp., Univ. Goteberg, Sweden). *Acta Med. Scand.* 197(3):217-223, 1975.

The role of the liver in pre-β-hyperlipoproteinemia was studied in 13 patients with types IIB and IV of the disease who presented for surgery with uncomplicated gallbaldder disease, (and in one, atherosclerotic abdominal aortic disease). Of these, five were fed a sucrose-enriched diet for 14 days prior to surgery. There were 40 controls, all presenting for surgery with uncomplicated gallbladder disease, and having no other known disorder. Of these, four were fed a sucrose-enriched diet for 14 days. No patients had known alcoholic problems or were on oral contraceptives. All fasted from 8 pm the day before until surgery at about 8 am. Liver biopsy was performed immediately and the liver slices prepared and incubated for determination of rates of glycerol and fructose incorporation into liver lipids and glycogen, determination of leucine incorporation into proteins, determinations of lipid phosphorus, glycogen, and protein, and determination of the rate at which labeled precursors were incorporated into triglycerides, phosphoglycerides, the fatty acid moeity of glycerides, and glycogen. Patients with the disease and on an ordinary diet had phosphoglyceride, glycogen, and protein concentrations similar to control values. The five fed sucrose showed a high triglyceride concentration (55 μM/g), low phosphoglyceride concentration (19.7 μM/g), high glycogen concentration (7.2 mg/100 mg) and normal protein concentration. Phosphoglyceride concentration in liver from patients with the disease on ordinary diet was the same as the control value. In diseased patients not given sucrose, glycerol was incorporated in triglyceride at a higher rate than that of controls. There was also a trend toward increased incorporation rate of this substrate into the fatty acid glyceride moiety. In the sucrose-fed diseased patients, glycerol was incorporated into triglyceride at the same rate as those on the ordinary diet (254 μM/g). However, incorporation of glycerol and fructose (51.0, 17.4, resp.) into hepatic phosphoglycerides were lower after sucrose feeding in diseased patients than those on ordinary diet. There was also a lower glycerol incorporation rate into glyceride fatty acid moieties in sucrose-fed patients (1.9 μM/g). Controls fed sucrose had a higher leucine incorporation rate into hepatic proteins than controls on ordinary diets. It is concluded that the vulnerability of hepatic phosphoglyceride and protein metabolism to sucrose is increased in patients with pre-β-hyperlipoproteinemia.

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4801 INVESTIGATION OF IMMUNOGLOBULINS IN CHRONIC LIVER DISEASES. *(Rus.)* Minogina, N. A.; Volkoslavskia, N. V. N. (Ukr. Inst. Postgrad. Med.. Kharkov, USSR). *Vrach. Delo* (12):82-85, 1974.

4802 IMMUNOGLOBULINS IN CHRONIC LIVER DISEASES. *(Pol.)* Pokora, J.; Tomaszewski, J.; Daniluk, J.; Kozak, J.; Czarnecki, J. (Acad. Med., Lublin, Poland). *Pol. Tyg. Lek.* 29(43):1827-1829, 1974.

4803 CHANGES IN THROMBOCYTE FUNCTION IN LIVER DISEASE. *(Ger.)* Schulz, K. (Dep. Med., Univ. Rostock, Germany). *Munch. Med. Wochenschr.* 116(47):2067-2072, 1974.

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4809 DYNAMIC LIVER SCANS IN DIAGNOSIS OF LIVER AND BILIARY DISEASES. *(Rus.)* Makarenko, T. P.; Nasatkin, Iu. M.; Khutiev, Ts. S.; Mironov, S. P.; Upyrev, A. V. (Cent. Inst. Postgrad. Med., Moscow, USSR). *Khirurgiia (Mosk.)* (11):74-78, 1973.

4810 COMBINED INSTRUMENTAL DIAGNOSIS OF LOCALIZED LIVER DISEASES. *(Rus.)* Epifanov, N. S.; Zhuravlev, V. A.; Korepanov, V. I. (Kirov Res. Inst. Blood Transfus., USSR). *Khirurgiia (Mosk.)* (11):68-74, 1973.

4811 NORMAL HEPATOGRAM IN THE NEWBORN. *(Sp.)* Torres Vera, M. T.; Villasmil Salas, J. A.; Ruiz Maury, A.; Diaz Isea, A. (Univ. Hosp., Maracaibo, Venezuela). *Rev. Fac. Med. Maracaibo* 6(1-4): 256-266, 1973.

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4813 RADIOIMMUNOLOGICAL DETECTION OF AUSTRALIA ANTIGEN (HG Ag) IN SALIVA IN VARIOUS LIVER DISEASES. *(Ger.)* Broderson, M.; Stegmann, S. (Luitpold Hosp., Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:465-467, 1974.

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4821 ^{67}Ga-SCINTIGRAPHY AS AN AUXILIARY METHOD FOR DIFFERENTIATION OF MASS LIVER LESIONS. *(Ger.)* Blazek, G.; Mastnak, C.; Kahn, P.; Weiss, W.; Hanak, H. (Inst. Nucl. Med., Vienna, Austria). *Wien. Klin. Wochenschr.* 87(3):77-81, 1975.

4822 ULTRASONIC ANALYSIS OF LIVER CANCER. *(Fr.)* Melki, G. (Fac. Med., Rennes, France). *J. Radiol. Electrol.* 55(3):223-232, 1974.

4823 AN AGGREGATE-HEMAGGLUTINATION METHOD FOR DIAGNOSIS OF HEPATOCELLULAR CANCER AND TERATOBLASTOMAS. *(Rus.)* Biriulina, T. I.; Levina, D. M.; Elgort, D. A.; Gusev, A. I.; Iazova, A. K. (N. F. Gamaleia Inst. Epidemiol. Microbiol., Moscow, USSR). *Vopr. Onkol.* 20(11):1-120, 1974.

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4829 A MULTIPLE CHEMOTHERAPEUTIC APPROACH TO THE MANAGEMENT OF HEPATOBLASTOMA. A PRELIMINARY REPORT. *(E.)* Holton, C. P.; Burrington, J. D.; Hatch, E. I. (Child. Hosp. Oncology Cent., Denver, Colo.). *Cancer* 35(4):1083-1087, 1975.

4830 ENZYME DETERMINATIONS IN THE DIAGNOSIS OF LIVER METASTASES. *(Sp.)* Garcia Bengoechea, M.; Ortega Vega, J.; Lanas Larranaga, E. (Nuestra Senora de Aranzazu Resid. Sanit., San Sebastian, Spain). *Rev. Clin. Esp.* 133(1):23-26, 1974.

4831 CONTROVERSIAL PROBLEMS IN HEPATECTOMY. *(Rus.)* Dederer, Iu. M.; Krylova, N. P.; Palamarchuk, V. P. (Altai Med. Inst., Barnaul, USSR). *Vestn. Khir.* 113(10):27-33, 1974.

4832 HEPATIC TRAUMA: FIVE CASES OF EMERGENCY MAJOR HEPATIC RESECTION. *(Fr.)* Atlas, H.; Allard, M.; Marcade, J. P. (Sacred Heart Hosp., Montpellier, France). *Rev. Fr. Gastroenterol.* (98):29-32, 35-38, 41-42, 1974.

4833 MAJOR HEPATECTOMY IN SURGICAL PRACTICE. *(Fr.)* Devic, G.; Garde, J.; Gelain, J.; Eymard, J. (no affil.). *Lyon Chir.* 71(1):3-8, 1975.

4834 MAJOR HEPATIC RESECTIONS IN CHILDREN. *(E.)* Martin, C. E.; Holcomb, G. W.; Foster, J. H.; (Vanderbilt Univ. Med. Cent., Nashville, Tenn.). *J. Pediatr. Surg.* 10(2):195-200, 1975.

4835 POSTOPERATIVE PROBLEMS AND MANAGEMENT AFTER HEPATIC RESECTION FOR BLUNT INJURY TO THE LIVER. *(E.)* Vajrabukka, T.; Bloom, A. L.; Sussman, M.; Wood, C. B.; Blumgart, L. H. (Glasgow R. Infirm., Scotland). *Br. J. Surg.* 62(3):189-200, 1975.

4836 BI-OCCLUSIVE CAVAL CATHETERIZATION IN MONITORING THE EFFICIENCY OF PORTOSYSTEMIC SHUNT OPERATIONS. *(It.)* Zannini, G.; Bracale, G. C.; Renda, A.; Masciariello, S. (2nd Fac. Med. Surg., Univ. Naples, Italy). *Chir. Gastroenterol.* 8(1):79-91, 1974.

4837 AN ENORMOUS INTRAHEPATIC SHUNT BETWEEN PORTAL VEIN AND HEPATIC ONE. *(E.)* Kozuka, S.; Sassa, R.; Kakumu, S. (Nagoya Univ. Sch. Med., Japan). *Angiology* 26(4):365-371, 1975.

4838 HEREDITARY ALPHA$_1$-ANTITRYPSIN DEFICIENCY ASSOCIATED WITH CONGENITAL EXTRAHEPATIC BILE DUCT HYPOPLASIA. *(E.)* Christen, H.; Bau, J.; Halsband, H. (Lubeck Med. Sch., Germany). *Klin. Wochenschr.* 53(2):90-91, 1975.

4839 STUDIES OF LIVER BIOPSIES IN THALASSEMIA MAJOR. *(Ger.)* Gmelin, K.; Rossner, J. A.; Feist, D. (Pathol. Inst., Univ. Heidelberg, Germany). *Verh. Dtsch. Ges. Pathol.* 57:251-257, 1973.

4840 STUDY ON A CASE OF SICKLE CELL-THALASSEMIA. HEPATIC HISTOPATHOLOGY. *(It.)* Menardo, G.; Di Pietro, P.; Marenco, G.; Galli, E.; Canepa, M. (S. Corona Hosp. Inst., Pietra Ligure, Italy). *Pathologica* 66(955/956):187-194, 1974.

4841 HEPATIC INVOLVEMENT IN SCLERODERMA. *(Ger.)* Rau, R.; Pfenninger, K.; Lobsiger, M. (Rheumatol. Clin., Univ. Zurich, Switzerland). *Schweiz. Med. Wochenschr.* 104(50):1877-1879, 1974.

4842 AGE-SPECIFIC FEATURES OF LIVER FUNCTION IN ESSENTIAL HYPERTENSION AND ATHEROSCLEROSIS. *(Rus.)* Fesenko, I. P. (Chernigov Reg. Hosp., USSR). *Vrach. Delo* (11):60-63, 1974.

4843 BENIGN FAMILIAL RECURRENT CHOLESTASIS (TYGSTRUP SYNDROME). *(Ger.)* Bosseckert, H.; Machnik, G.; Abendroth, K.; Eitner, K. (Med. Clin., Friedrich Schiller Univ., Jena, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 34(1):43-44, 1974.

4844 CHANGES IN THE FATTY ACID PATTERN OF TRIGLYCERIDES IN THE HEPATIC PARENCHYMA AND STORED LIPIDS IN DIABETICS AS A FUNCTION OF HEPATIC STEATOSIS. *(Ger.)* Singer, P.; Gnauck, G.; Thoelke, H.; Honigmann, G.; Buntrock, P.; Kettler, L. H. (Kaulsdorf Munic. Hosp., Berlin, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 34(1):27-35, 1974.

4845 TWO CASES OF ACUTE INTERMITTENT HEPATIC PORPHYRIA. *(Pol.)* Rogoz, J.; Kulakowski, S.; Lukomska, K. (Munic. Hosp., Sanok, Poland). *Wiad. Lek.* 27(24):2157-2160, 1974.

4846 CLINICAL AND HISTOLOGICAL FINDINGS IN 12 JAUNDICED PATIENTS WITH PULMONARY TUBERCULOSIS. *(It.)* Piccinino, F.; Manzillo, G.; Sagnelli, E.; Castaldo, M.; Balestrieri, G. G.; Arciello, G. (1st Fac. Med. Surg., Univ. Naples, Italy). *Fegato* 19(3):607-616, 1973.

4847 INTRAHEPATIC LITHIASIS. *(It.)* Benedetti-Valentini, S.; Benedetti-Valentini, G. (United Hosp., Rome, Italy). *Osp. Ital. Chir.* 27(1):17-23, 1974.

4848 CONTRIBUTION TO THE ETIOLOGY OF "REVERSIBLE HEPATIC DYSFUNCTION" (STAUFFER'S SYNDROME) ASSOCIATED WITH RENAL TUMORS. *(Ger.)* Girmann, G.; Gratzl, M.; Pees, H.; von Seebach, N. B.; Scheurlen, P. G. (Med. Clin. I, Univ. Saarland, Homburg/Saar, Germany). *Dtsch. Med. Wochenschr.* 100(10):480-484, 1975.

4849 HYPOGONADISM IN MALE PATIENTS WITH CHRONIC LIVER DISEASES. *(Ger.)* Szarvas, F.; Julesz, J.; Toth, I.; Faredin, I. (Med. Clin. I, Univ. Szeged, Hungary). *Z. Gesamte. Inn. Med.* 30(6):254-256, 1975.

4850 BIOPTICAL LIVER CHANGES IN FLORID HYPERTHYREOSIS. *(E.)* Lorenz, G.; Meng, W. (Pathol. Inst., Ernst Moritz Arndt Univ., Greifswald, Germany). *Acta Hepatogastroenterol. (Stuttg.)* 22(1):22-25, 1975.

4851 THE EFFECT OF 14-DAY STARVATION ON MORPHOLOGICAL CHANGES IN THE LIVER IN PATIENTS WITH SIMPLE OBESITY. *(Pol.)* Tycowa, M.; Salwa-Kubasik, W. (Acad. Med., Poznan, Poland). *Pol. Arch. Med. Wewn.* 52(1):49-56, 1974.

4852 FREE AMINO ACIDS OF THE BLOOD SERUM AND CERTAIN PARAMETERS OF THE LIVER FUNCTION IN PATIENTS WITH CIRCULATORY DISORDERS. *(Rus.)* Sivkov, I. I.; Lebedeva, N. A. (I. M. Sechenov 1st Moscow Med. Inst., USSR). *Kardiologiia* 14(1):43-48, 1974.

4853 HEPATIC SECRETORY OBSTRUCTION WITH TOTAL PARENTERAL NUTRITION IN THE INFANT. *(E.)* Touloukian, R. J.; Seashore, J. H. (Yale Univ. Med. Sch., New Haven, Conn.). *J. Pediatr. Surg.* 10(3): 353-360, 1975.

See also, 4008, 4191, 4198, 4213, 4214, 4232, 4260, 4261, 4263, 4268, 4269, 4270, 4271, 4292, 4294, 4298, 4555, 4899, 4904, 4952, 5094, 5148, 5154.

LIVER AND BILIARY TRACT

Hyperbilirubinemic States

4854 STUDIES ON PHOTOTHERAPY IN NEWBORN INFANTS. INFLUENCE ON PROTEIN BINDING OF BILIRUBIN AND SALICYLATE AND ON ACTIVITY OF ACETYLSALICYLIC ACID ESTERASE. *(E.)* Windorfer, Jr. A.; Faxelius, G.; Boreus, L. O. (Karolinska Hosp., Stockholm, Sweden). *Acta Paediatr. Scand.* 64(2):293-298, 1975.

Protein binding both of bilirubin and salicylate before and after phototherapy was studied in newborns with hyperbilirubinemia. The effect of light on acetylsalicylic acid esterase was also studied, and for comparison, parallel experiments were done on light-treated rabbits and on light-treated blood and plasma *in vitro*. Newborns (15) were subjected to phototherapy for 2-4 days for hyperbilirubinemia; five neonates from the same ward were used as control patients. Blood analyses were made before and after phototherapy. An increase was observed in hematocrit values and in the activity of the erythrocyte enzyme acetylsalicylic acid esterase. The elevation of the enzyme activity also could be produced in light-treated rabbits and *in vitro* after illumination of blood from adult volunteers. The binding of bilirubin to serum albumin and of salicylate to plasma proteins was not altered, nor were the concentrations of albumin or total proteins in plasma. The results indicate that light does not increase the unbound fraction of bilirubin in blood.

4855 THE PLACE OF NON-CONJUGATED BILIRUBIN AND SERUM ALBUMIN DOSAGES IN THE SURVEILLANCE OF PREMATURE ICTERUS. *(Fr.)* Satge, P.; Colin, J.; Voyer, M.; Crumiere, C.; Charlas, J. (Inst. Pericult., Paris, France). *Arch. Fr. Pediatr.* 31 (2/3):201-213, 1974.

4856 THE ELEMENTS OF THERAPY IN THE CRIGLER-NAJJAR SYNDROME. *(It.)* Bartolozzi, G.; Ciampolini, M.; Gentilini, P. (Inst. Clin. Pediatr., Univ. Florence, Italy). *Fegato* 19(2):457-468, 1973.

See also, 4116, 4117, 4122, 4123.

LIVER AND BILIARY TRACT

Nonviral Hepatitis and Hepatic Injury

4857 HALOTHANE-RELATED HEPATITIS. A CLINICAL STUDY OF TWENTY-SIX CASES. *(E.)* Moult, P. J. A.; Sherlock, S. (R. Free Hosp., London, England). *Q. J. Med.* 44(173):99-114, 1975.

The clinical details of halothane-induced hepatitis were reviewed in 26 cases. The mean body weight was 68.4 kg for the women and 74.4 kg for the men. No patients were considered where hepatitis might have been attributable to another anesthetic. None had either alcoholism or chronic liver disease. With the exception of four laparotomies and four craniotomies, the operations were relatively minor. All 26 patients became jaundiced within 12 days of halothane anesthesia. One patient gave a history of jaundice after an anesthetic 8 yr previously. Excepting two patients, all had 2, 3, or 4 exposures to halothane within a 3-month period. Eight patients had blood transfusions, seven of them within the previous month. Eight were given phenothiazine drugs and two coricosteriods postoperatively, and 16 were given antibiotics and two diphenylhydantoin preoperatively. Eight patients had delayed and unexplainable pyrexia as previously described in halothane-induced hepatitis. Treatment of fulminant hepatic failure was by dextrose infusion, oral neomycin, enemas, and vitamin K. All 11 patients who died were in fulminant hepatic failure. Two were treated by exchange transfusion. Jaundice in the 15 survivors lasted from 1-12 weeks. None developed any clinical or biochemical evidence of liver disease. The minimum thrombo-test in the fatal cases was 15% or less, while only three of the survivors had less than 15%. Mean body weight was 79.8 kg in fatal cases as opposed to 64.9 kg for survivors. All fatal cases became jaundiced within 7 days of the last anesthetic, while all who became jaundiced after this time survived. It is concluded that halothane-induced hepatitis should be regarded as a clinical entity, and prognosis is related to obesity and rapidity with which jaundice appears postoperatively.

4858 HEPATIC COMPLICATIONS OF ANTITUBERCULOUS THERAPY. *(E.)* Rossouw, J. E.; Saunders, S. J. (Groote Schuur Hosp., Capetown, South Africa). *Q. J. Med.* 44(173):1-16, 1975.

The frequency of hepatic reactions to drug treatments for pulmonary tuberculosis and patterns for each drug (sensitization time, associated hypersensitivity, biochemical findings and prognosis) were investigated. Records of 7492 patients admitted to two hospitals for pulmonary tuberculosis between 1960 and 1973 were included in the study. Drug hepatitis was diagnosed if the patient became clinically jaundiced or had at least two abnormal liver function tests. Patients with abnormal baseline liver function tests, or who had a history of alcoholism, recent blood transfusion, liver disease, contact with infectious hepatitis or exposure to other drugs were excluded. The reaction was assigned to a particular drug: if the patient was on the drug for at least 3 weeks preceeding the reaction; if after withdrawal, rechallenge reproduced the reaction; if after withdrawal, rechallenge with other drugs did not reproduce the reaction; or after withdrawal of the suspected drug but with continuation of other drugs, the reaction settled. Of the 7492 cases, there were 24 cases of hepatitis (0.32%); 14 cases from another hospital were added. Para-aminosalicyclic acid was implicated in 16 cases, while in 12 cases it was either this agent or isonicotinic hydrazide. The latter alone was responsible for three cases, ethionamide for one, and multiple drugs for three. The three isonicotinic hydrazide patients were over 50 yr of age, as compared to five in this age bracket in the remaining 35 cases. The time between the starting of the drug and the first symptom was under 90 days in all cases. Most (89%) of the patients had premonitory symptoms preceeding the jaundice, including rash (23 patients), pyrexia, and gastrointestinal disturbances. Clinical jaundice developed in all but five. Skin lesions were found in 80%. Pyrexia was common in the para-aminosalicyclic acid (69%) and para-aminosalicyclic acid plus isonicotinic hydrazide (85%) groups, and lymphadenopathy was found in 46% of both. Hepatomegaly was almost universal. No patients with para-aminosalicyclic acid hepatitis died, while there was a 25-33% mortality in the other groups. It is suggested that such patients be kept under close surveillance and drug therapy stopped as soon as warning symptoms appear.

4859 THE COMPETING RISKS OF TUBERCULOSIS AND HEPATITIS FOR ADULT TUBERCULIN REACTORS. *(E.)* Comstock, G. W.; Edwards, P. Q. (Sch. Hyg. Public Health, Johns Hopkins Univ., Baltimore, Md.). *Am. Rev. Respir. Dis.* 111(5):573-577, 1975.

The competing risks of tuberculosis and isoniazid-associated hepatitis were estimated according to the best evidence now available. Tuberculosis risks were derived from two sets of data on adult reactors to 5 TU of purified protein derivative: average annual tuberculosis case rates during a 20-yr period among reactors in Muscogee County, Georgia, and Russell County, Alabama; and average annual case rates during a 10-yr period among reactors given placebo in mental hospitals in Georgia, Massachusetts, and Wisconsin. Hepatitis risks were derived from U.S. Public Health Service information on persons over 20 yr who had taken isoniazid for up to 1 yr. Lifetime tuberculosis risks/1000 reactors and the number of tuberculosis cases preventable by isoniazid prophylaxis are shown according to race, sex, and age (25-65 yr). Estimated hepatitis rates/1000 persons are given for specified ages, as are the expected number of cases among 1000 reactors completing 1 yr of isoniazid treatment. The ratio of tuberculosis cases preventable by treatment to hepatitis cases occurring during treatment is specified according to race, sex, and age. The probability of developing hepatitis during 1 yr of treatment with isoniazid ranges from 2.4/1000 adults younger than 35 yr to 19.2/1000 at 55-64 yr. It is concluded that the upper age limit for isoniazid prophylaxis should be set at 45 yr for reactors without additional risk factors. With additional risk factors, such as recent conversion or household exposure, abnormal chest roentgenogram, diabetes, or long-term corticosteroid therapy, it is probably wise to give preventive treatment to all but the very old.

4860 DIAGNOSIS OF ACUTE SYPHILITIC HEPATITIS. *(Rus.)* Zeldin, V. E.; Storozhakova, I. A.; Vishneevtskii, A. M.; Kelner, R. I. (Cent. Res. Inst. Dermatol. Syphilol., Moscow, USSR). *Klin. Med. (Mosk.)* 52(11):133-135, 1974.

A case is reported of acute syphilitic hepatitis in a 43-yr-old man hospitalized with complaints of anemia, loss of appetite, nausea, jaundice, itching and subfebrile fever. No pathology of the urinary system was observed. The liver was enlarged 4 cm beyond the costal arch. Blood values upon admission were Hgb 13 g%; erythrocytes 4,100,000 mm^3; color index 0.92; leukocytes 8,000; ESR 22 mm/hr. Urine values were: nitrogen 22 mg%; bilirubin 4.72 mg%; cholesterol 252 mg%; SGOT 48 U; SGPT 50 U; whole protein 8.17 g%; albumin 39.6%; globulin α_1 = 9.4%; α_2 = 13.6%; β = 15.3%; γ 22.1%. The albumin-globulin coefficient was 0.66. The case was diagnosed as chronic hepatitis and prednisolone treatment (15 mg/day) was prescribed with glucose, cocarboxylase and vitamins. On the 16th day of hospitalization moist papules were observed in the anal region. Wassermann reaction was ++++ (titre 1:320). Kahn's and Sachs-Witebsky tests were strongly positive. Roseola elements were observed on the body skin; papule-like formations, on the palms and feet. The diagnosis was recurrent secondary syphilis and acute syphilitic epithelial hepatitis. Treatment by penicillin (14,000,000 U) was prescribed.

The blood and urine values returned to normal 1 month after the treatment began. Wassermann and precipitation tests continued to be strongly positive. The patient was discharged in a satisfactory condition. It is indicated that clinically and morphologically, acute syphilitic hepatitis has much in common with viral hepatitis except for certain specific features: 1) jaundice is accompanied by eruptions on the skin and mucous membranes; 2) the process in the liver is quickly reversed as a result of antisyphilitic treatment; and 3) a sharp drop in the albumin content and an increase in the globulin content is observed.

4861 HEPATITIS DUE TO AFLATOXICOSIS: AN OUTBREAK IN WESTERN INDIA. *(E.)* Krishnamachari, K. A. V. R.; Nagarajan, V.; Bhat, R. V.; Tilak, T. B. G. (Indian Counc. Med. Res., Hyderabad). *Lancet* 1(7915):1061-1063, 1975.

An epidemic of hepatitis in parts of western India was reported; the syndrome was characterized by icterus, rapid onset of signs of portal hypertension, ascites, and a high mortality rate. The disease affected man and dogs and was associated with the consumption of maize heavily contaminated with *Aspergillus flavus*; 106 of 397 patients died. In five maize samples obtained from affected households, the aflatoxin levels ranged between 6.25 and 15.6 ppm; thus, the patients would have ingested 2-6 mg aflatoxin/day for several weeks. Detectable levels of aflatoxin B_1 were found in 2 of 7 serum samples. A specimen of liver obtained at necropsy showed bile duct proliferation and giant cells. The observations indicate that staple foodgrains can become sufficiently infected to result in disease, and that there is a need for divising means of averting such contamination.

4862 CHOLESTATIC HEPATITIS AFTER ADMINISTRATION OF FURAN DERIVATIVES. *(E.)* Engel, J. J.; Vogt, T. R.; Wilson, D. E. (Abraham Lincoln Sch. Med., Univ. Ill., Chicago). *Arch. Intern. Med.* 135 (5):733-735, 1975.

A case was reported of a patient who developed jaundice following nitrofurantoin therapy and subsequently developed a second episode of liver injury following intravaginal administration of a mixture of nifuroxine and furazolidone. Liver function tests following nitrofurantoin therapy for a urinary tract infection (300 mg/day, 7 days) showed liver enzyme values of: SGOT, 121 U; SGPT, 256 U; alkaline phosphatase, 350 IU. The patient was treated for vaginal trichomoniasis 1 week later and received two vaginal suppositories, each containing furazolidone (5 mg) and nifuroxime (7.5 mg); liver enzyme values that day were SGOT, 49 U; SGPT, 96 U; and alkaline phosphatase, 169 IU. The enzyme levels 4 days later rose to: SGOT, 256 U; SGPT, 325 U; and alkaline phosphatase, 760 IU. Fractionation of the alkaline phosphatase showed that it was of liver origin. After discontinuing the suppository therapy, the liver enzymes slowly returned to normal. The data suggest cross-sensitivity between the two furan derivatives and that such cross-sensitivity of chemically related compounds be considered even when they are administered by different routes.

4863 THREE CASES OF SEVERE ACUTE HEPATIC FAILURE OCCURRED AFTER REPEATED HALOTHANE ANESTHESIA. *(E.)* Kosaka, Y.; Matsuda, Y.; Tagawa, S.; Terada, M.; Akeda, S.; Nakagiri, S.; Tameda, Y.; Tsujita, E.; Kondo, I.; Shiomi, Y.; Kawarada, R.; Okuda, Y. (Mie Sch. Med., Tsu, Japan). *Mie. Med. J.* 24(1):81-92, 1974.

4864 DRUG INDUCED SUBACUTE HEPATITIS TREATED WITH EXCHANGE BLOOD TRANSFUSION. *(E.)* Kosaka, Y.; Matsuda, Y.; Tagawa, S.; Terada, M.; Nakagiri, S.; Kondo, I.; Tameda, Y.; Shiomi, Y.; Tsujita, E.; Kawarada, R.; Okuda, Y.; Kawakita, K.; Akeda, S. (Mie Univ. Sch. Med., Tsu, Japan). *Mie Med. J.* 24(1):93-100, 1974.

4865 HEPATOTOXICITY OF RIFAMPICIN AND ISONIAZID IN CHILDREN. *(E.)* Casteels-Van Daele, M.; Igodt-Ameye, L.; Corbeel, L.; Eeckels, R. (Dep. Pediatr., Univ. Louvain, Belgium). *J. Pediatr.* 86 (5):739-741, 1975.

4866 CADMIUM - ITS IN VIVO DETECTION IN MAN. *(E.)* McLellan, J. S.; Thomas, B. J.; Fremlin, J. H.; Harvey, T. C. (Dep. Phys., Univ. Birmingham, England). *Phys. Med. Biol.* 20(1):88-95, 1975.

4867 LIVER FUNCTION DISORDERS INDUCED BY ANTIBACTERIALS USED IN THE TREATMENT OF CHRONIC PULMONARY TUBERCULOSIS. *(It.)* Gammarrota, V.; Grassi, P. E. (Spec. Prov. Hosp. Tuberc., Ente, Italy). *Fegato* 19(3):617-626, 1973.

4868 THE INCIDENCE OF THE LIVER DAMAGE IN PREGNANT SICILIAN WOMEN. *(It.)* Carollo, F.; Barba, G.; Cadilli, G. (Inst. Clin. Obstet. Gynecol., Univ. Palermo, Italy). *Rev. Ital. Gynecol.* 55(4): 341-350, 1974.

4869 NON-PARASITIC LIVER CYSTS: REPORT OF A CASE. *(Fr.)* Bekaert, S.; Afschrift, M.; Verdonk, G.; Kunnen, M. (Acad. Hosp., Univ. Gand, Belgium). *Ann. Radiol. (Paris)* 17(5):445-449, 1974.

See also, 4846, 5137, 5138, 5139, 5142, 5144, 5145, 5146, 5149.

Acute Viral Hepatitis

4870 THERAPEUTIC EFFECT OF GLUCOCORTICOIDS ON THE COURSE OF VIRAL HEPATITIS IN CHILDREN WITH REGARD TO THE PRESENCE OF AUSTRALIA ANTIGEN. *(Pol.)* Kossakowski, R.; Sokolewicz, E.; Szelag, O. (Acad. Med., Bialystok, Poland). *Pediatr. Pol.* 48 (10):1197-1202, 1973.

Fifteen children (aged 3 months to 12 years) with viral hepatitis and serum Australia antigen (AuAg) and 15 children of the same age with viral hepatitis but without AuAg were treated with 1 mg/kg/day prednisone for 3-6 weeks. AuAg-positive children had a longer history of the disease and were ill longer (up to 147 days) before therapy than AuAg-negative children (maximum duration 71 days). However, the thymol turbidity test, SGPT and SGOT activity, and hepatomegaly were less pronounced in AuAg-positive than in AuAg-negative children. After prednisone therapy the Au Ag-negative children showed rapid clinical and biochemical improvement, while AuAg-positive children showed only transient improvement; 2 weeks after discontinuation of the therapy the serum transaminase activities and hepatomegaly recurred.

4871 CELL-MEDIATED IMMUNITY IN ACUTE AND CHRONIC HEPATITIS. *(E.)* Wands, J. R.; Perrotto, J. L.; Alpert, E.; Isselbacher, K. J. (Harvard Med. Sch., Boston, Mass.). *J. Clin. Invest.* 55(5):921-929, 1975.

Peripheral lymphocytes from 22 patients (18 men and 4 women, aged 18-65 yr) with acute hepatitis, chronic active hepatitis, or chronic persistent hepatitis and from nine controls were tested for *in vitro* cytotoxicity and blast transformation. Of the 22 patients, 17 were positive and five were negative for hepatitis-B surface antigen (HB$_s$Ag). Cytotoxicity was measured by ^{51}Cr release into the medium from labeled Chang cells after 6-hr incubation with peripheral lymphocytes at a lymphocyte target cell ratio of 200:1. Concomitant 72-hr incubation studies were performed to assess thymus cell-dependent (T) lymphocytic function as measured by concanavalin A (Con A)-stimulated incorporation of tritiated thymidine (blast transformation) and by cytotoxicity. Lymphocytes from patients with acute hepatitis were significantly cytotoxic to Chang cells compared with control lymphocytes (12.71% *versus* 2.71%). Lymphocytes from patients with acute and chronic hepatitis were less cytotoxic when incubated with autologous and homologous HB$_s$Ag-positive serum; and lymphocytes from patients with HB$_s$Ag-positive and negative acute, chronic active hepatitis, or chronic persistent hepatitis were as cytotoxic as normal controls when stimulated with Con A. Lymphocytes from chronic active hepatitis patients on prednisone therapy (30 or 50 mg/day for 2.5 months) showed marked depression of cytotoxicity when stimulated with Con A. These studies show that patients with acute hepatitis have circulating T lymphocytes that are capable of causing destruction of Chang liver cells; that patients with acute and chronic hepatitis have a serum factor(s) that inhibits spontaneous and induced lymphocyte cytotoxicity and blast transformation; and that prednisone treatment appatently inhibits lymphocyte toxicity in patients with chronic active hepatitis.

4872 PROPHYLAXIS OF POSTTRANSFUSION HEPATITIS: BIOCHEMICAL TESTS FOR RESEARCH IN BLOOD DONORS. *(Fr.)* Plomteux, G. (Lab., Med. Chem., Liege, Belgium). *Ann. Gastroenterol. Hepatol. (Paris)* 10(5):401-411, 1974.

Patients with acute viral hepatitis (110) were checked weekly until 34 parameters relating to hepatic function indicated normalization of hypertransaminasemia. The frequency of perturbation of the parameter and degree of global sensitivity of the test in the population studied were calculated for each parameter. It was found that the highest frequencies of perturbations were for SGPT (100.00%), SGOT (98.21%), and ornithine carbamoyltransferase (OCT), (85.71%). The coefficients of sensitivity for the tests for the three substances were, resp., 118.43, 79.29, and 50.24. In 2 yr, 5,397 U of blood were transfused and assayed for degree of perturbation in the concentration of SGPT, SGOT, and OCT. One or more of the enzymes occurred in abnormal concentrations in 6.32% of the donors, but only 2.68% showed perturbation of the concentrations of all three enzymes and in the relative order determined in the tests on hepatitis patients. The latter units of blood were classified as biochemically suspect if the value of the SGPT was at least 100 mIU. A number of patients who had received both normal and suspect blood were followed up. A statistically significant difference was found in the subsequent evolution of plasma concentrations of the three enzymes in the recipients of normal *versus* suspect blood. In 2 examples of the development of recipients of suspect blood, the plasma concentrations of the three enzymes increased tremendously by the fourth or fifth week after transfusion, and then gradually returned to normal.

4873 HOST COMPONENTS IN HEPATITIS B ANTIGEN. *(E.)* Burrell, C. R. (Edinburgh Univ. Med. Sch., Scotland). *J. Gen. Virol.* 27(2):117-126, 1975.

Radioimmunoassays were performed to determine if 20-25 nm hepatitis antigen (HB Ag) particles are intrinsically composed of normal serum components, modified by hepatitis B virus infection in the host to express a unique virus-specific antigenic character, or whether these particles represent primarily virus-code material, associated in some preparations with contaminating serum components. Purified ^{125}I-labeled 20-25 nm HB Ag particles gave low affinity immunoprecipitation reactions with antisera to several normal serum components; the reactions were immunologically distinct from the reaction due to the classical HB Ag surface determinant. These additional antigenic determinants were acid-stable and tightly bound to the particles; they could not be released by treatment with Tween 80 or ether, but were removed by protease digestion with preservation of particle integrity. It was not possible to distinguish whether they were due to the presence of trace amounts of partly denatured serum components, or to a weak cross-reaction with antigens present in normal serum. Some cross-reaction with antigens in normal serum, in particular involving the superficial carbohydrate moieties of HB Ag, would not be surprising in sensitive assays. No evidence was found for native antigenic material, present in normal serum or normal liver cells, being integral to the structure of these particles.

4874 SERUM IMMUNOGLOBULIN M (IgM) VALUES IN VIRAL HEPATITIS PATIENTS.

(E.) Ene, M.; Roman, D.; Luca, V.; Duda, R. (Iasi Inst. Med. Pharm., Rumania). *Rev. Med. Chir. Soc. Med. Nat. Iasi* 78(3): 659-662, 1974.

Serum immunoglobulin M (IgM) levels were measured by radial immunodiffusion in 80 patients with jaundice, of whom 68 had viral hepatitis and 12 (controls) had other hepatobiliary diseases. In 12 viral hepatitis patients with Australia antigen (HB$_s$Ag) and eight without HB$_s$Ag but with a long period of incubation (more than 60 days), the mean serum IgM value was 197 mg/100 ml or close to the control value of 144 mg/100 ml. These 20 patients were assumed to have virus B hepatitis. The remaining 48 viral hepatitis patients without HB$_s$Ag had a significantly higher IgM level of 273 mg/100 ml. This group was considered to have virus A hepatitis. The results suggest that determination of serum IgM within the first 10 days of jaundice would permit differentiation of the two forms of viral hepatitis according to immunologic criteria.

4875 PROGNOSTIC SIGNIFICANCE OF SUBACUTE HEPATIC NECROSIS IN ACUTE HEPATITIS.

(E.) Ware, A. J.; Eigenbrodt, E. H.; Combes, B. (Univ. Texas Southwest. Med. Sch., Dallas). *Gastroenterology* 68 (3):519-524, 1975.

A retrospective analysis was made of 57 patients treated during the period 1967-1973 with the lesion of subacute hepatic necrosis in the setting of acute hepatitis. Of the 57 patients, 40% were male and 60% female, with 63% under 30 yr of age, and 21% over 40 (age range of 14-88 yr). Epidemiology included contact with hepatitis (25%), blood transfusion (4%), i. v. drug use (26%), and hepatotoxic drugs (12%). Of the 49 patients so tested, 67% carried Australia antigen (HB$_s$Ag) in their sera. Excluding the seven patients considered to have a drug-related liver injury, the incidence of HB$_s$Ag positivity rises to almost 80%. The drugs implicated as the probable etiologic agent in these seven were halothane (three), aldomet (two), isoniazid, and propylthiouracil. Of the 57 patients, 14 were lost to follow-up but were doing very well when last seen. One paitent died with massive hepatic necrosis 6 weeks after her biopsy had shown the lesion of subacute hepatic necrosis. The remaining 42 were observed from 2-73 months (average 19 months). Eight patients progressed to chronic active liver disease, one of whom died in hepatic failure after 14 months of continuous disease. In the other 34 patients, liver function tests returned to normal and remained so without therapy. In managing patients with subacute hepatic necrosis, high dose steroid therapy was instituted on making the diagnosis unless clinical and biochemical improvement was already underway. Thus, steroids were more likely given to the most seriously ill patients. The patient who progressed to massive necrosis did so despite high dose prednisolone therapy. Not one of the eight patients who developed chronic active liver disease, however, received steroid therapy during their acute illness, although a number of them have since been so treated. Thus the results of this study do not support the view that steroid therapy in acute hepatitis may actually encourage the development of chronic disease. Repeat biopsies from 10 months to 6 yr after the initial biopsy in nine of the 34 patients who underwent biochemical resolution showed two of them with inactive postnecrotic cirrhosis. The incidence of these complications developing in patients with subacute hepatic necrosis was about 30% in this study. These findings add qualititive support to the position that liver biopsy findings bear important prognostic value in patients with acute hepatitis.

4876 AUSTRALIA-ANTIGEN (HB$_s$Ag) AND HEPATITIS IN CHILDHOOD.

(Ger.) Hellwege, H. H. (Univ. Clin. Pediatr., Hamburg-Eppendorf, Germany). *Monatsschr. Kinderheilkd.* 122(12):893-899, 1974.

Transient Australia antigen (HB$_s$Ag) was detected in sera from two children of 12 with acute sporadic hepatitis who had not been exposed to potential parenteral infective agents. One of these had a long lasting close contact with a chronic HB$_s$Ag carrier. Five of seven children with acute hepatitis following blood transfusions were HB$_s$Ag-positive. In all cases of acute hepatitis, whether HB$_s$Ag positive or negative, the illness was transient, and persistence of HB$_s$Ag never occurred. Five of eight children with chronic active hepatitis were HB$_s$Ag carriers. Parenteral exposure to potentially virus B-containing infective agents could be excluded in every case. Antinuclear antibodies were detected in the sera of two HB$_s$Ag-negative patients. During 15 months sera of 71 polytransfused children with hemophilia were tested serially. In this period five children developed acute hepatitis: two of them were chronic HB$_s$Ag carriers; and in one boy HB$_s$Ag could be detected only for a short time. When serum bilirubin and transiminase levels normalized, one chronic HB$_s$Ag carrier became negative. Two patients with hepatitis were known as chronic HB antibody (HB$_s$Ab) carriers. Antibodies against HB$_s$Ag were detected in sera of 26 patients with hemophilia without liver disease. More boys than girls suffering from acute and chronic hepatitis could be observed. The boys were predominating in both HB$_s$Ag-positive and negative groups. The incidence of HB$_s$Ag detection in these children suggests that Virus B-infection may play an important role in the pathogenesis of chronic active hepatitis in childhood.

4877 A STATISTICAL CONTRIBUTION ON HEPATITIS AND THE AUSTRALIA ANTIGEN AMONG YOUNG 'ITINERANTS' TO QUEBEC. *(Fr.)* Maurice, P.; Valet, J. P.; Rousseau, C.; Matte, J. (Laval Univ. Hosp. Cent., Quebec, Canada). *Union Med. Can.* 104(3):436-439, 1975.

4878 FREQUENCY OF THE AUSTRALIA ANTIGEN (HB_S AG) AMONG THE POPULATION OF THE CITY OF QUEBEC AND EAST OF QUEBEC PROVINCE TABULATED BY RADIOIMMUNOLOGICAL TECHNIQUES. *(Fr.)* Valet, J. P.; Rousseau, C.; Ackerman, H. W.; Matte, J. (Laval Univ. Hosp. Cent., Quebec, Canada). *Union Med. Can.* 104(3):439-443, 1975.

4879 RELATION BETWEEN HEPATITIS B ANTIGEN AND SOME CLINICAL HISTOLOGICAL AND LABORATORY DATA IN CHRONIC AGGRESSIVE HEPATITIS. *(It.)* Guisti, G.; Piccinino, F.; Galanti, B.; Ruggiero, G.; Manzillo, G.; Sagnelli, E.; Utili, R. (Fac. Med. I, Univ. Naples, Italy). *Rass. Clin. Sci.* 50(2):48-53, 1974.

4880 INVESTIGATIONS CONCERNING THE FIXATION OF HEPATITIS B-ANTIGEN (HBAg) ON PERIPHERAL LYMPHOCYTES AND ISOLATED HEPATOCYTES IN PATIENTS WITH INFLAMMATORY LIVER DISEASES. *(Ger.)* Arnold, W.; Meyer zum Buschenfelde, K. H.; Hopf, U.; Kordbarlag, C. (Med. Clin. II, Johannes Gutenberg Univ., Mainz, Germany). *Klin. Wochenschr.* 53(5):231-235, 1975.

4881 ENCAPSULATING PERI-HEPATITIS. REPORT OF FOUR CASES. *(Fr.)* Debray, C.; Leymarios, J.; Cerf, M.; Husson, J. M. (Bichat Hosp., Paris, France). *Sem. Hop. Paris* 51(5):289-297, 1975.

4882 COMPARITIVE EPIDEMIOLOGICAL AND CLINICAL STUDIES ON HEPATITIS A AND B IN THE MAGDEBURG AREA. *(Ger.)* Herms, G.; Kramer, G. (Reg. Hosp., Magdeburg-Altstadt, Germany). *Z. Gesamte. Inn. Med.* 30(5):183-187, 1975.

4883 DETERMINATION OF ENDOGENOUS VITAMIN B_{12} BY THE RADIOISOTOPE METHOD IN CHILDREN WITH VIRUS HEPATITIS. *(Pol.)* Kaczmarski, M. (Acad. Med., Bialystok, Poland). *Pediatr. Pol.* 50(1):37-45, 1975.

4884 HEMOSTASIS SYSTEM IN VIRUS HEPATITIS. PART II. FIBRINOLYTIC SYSTEM. *(Pol.)* Rosiek, B. (Acad. Med., Lodz, Poland). *Pol. Arch. Med. Wewn.* 52(1):41-47, 1974.

4885 HEMOSTATIC SYSTEM IN VIRUS HEPATITIS. PART III. SOLUBLE FIBRIN MONOMER COMPLEXES AND FIBRINOGEN DEGRADATION PRODUCTS IN PATIENTS WITH SEVERE VIRUS HEPATITIS. *(Pol.)* Rosiek, B. (Acad. Med., Lodz, Poland). *Po. Arch. Med. Wewn.* 52(2):173-178, 1974.

4886 HEMOSTASIS SYSTEM IN VIRUS HEPATITIS. *(Pol.)* Rosiek, B. (Acad. Med., Lodz, Poland). *Pol. Arch. Med. Wewn.* 52(2):179-186, 1974.

4887 HEMOSTASIS SYSTEM IN VIRUS HEPATITIS. PART I. BLOOD CLOTTING SYSTEM. *(Pol.)* Rosiek, B. (Acad. Med., Lodz, Poland). *Pol. Arch. Med. Wewn.* 52(1):31-40, 1974.

4888 EFFECT OF INFECTIOUS HEPATITIS ON THE COURSE OF PRIMARY HYPERLIPOPROTEINAEMIA. *(Cz.)* Kucerova, I.; Brodanova, M. (Dep. Gen. Med., Charles Univ., Prague, Czechoslovakia). *Cz. Gastroenterol. Vyz.* 28(6):397-401, 1974.

4889 FUNCTIONAL AND HISTOLOGICAL CONDITION OF GASTRIC MUCOSA IN PATIENTS AFTER INFECTIOUS HEPATITIS. *(Rus.)* Barba, E. I.; Vasilyuk, V. N.; Boiko, M. S. (Ternopol Med. Inst., USSR). *Klin. Med. (Mosk.)* 52(11):97-101, 1974.

4890 PATHOGENETIC THERAPY IN CHILDREN WITH VIRAL HEPATITIS. *(Rus.)* Nisevich, N. I.; Uchaikin, V. F.; Novokshonov, A. A.; Yakob, L. E. (N. I. Pirogov 2nd Moscow Med. Inst., USSR). *Vopr. Okhr. Materin. Det.* 18(12):3-9, 1973.

4891 THE CONTENT OF HISTAMINE IN THE BLOOD AND HISTAMINE-BINDING CAPACITY OF PLASMA PROTEINS IN VIRAL HEPATITIS. *(Rus.)* Sorinson, S. N.; Mikhailenko, A. A. (Kishinev Med. Inst., USSR). *Klin. Med. (Mosk.)* 52(11):89-93, 1974.

4892 THE ULTRASTRUCTURE OF GIANT CELLS IN HEPATITIS: ETIOPATHOGENETIC CONSIDERATIONS. *(Sp.)* Varela Nunez, R.; Diaz-Flores, L.; Ortiz Urdian, G.; Abad, J.; Sanchez Salgado, G. (Sch. Pathol. Histol. Anat., Santiago, Chile). *Rev. Clin. Esp.* 133 (1):11-16, 1974.

4893 STATISTICAL STUDY ON THE AUSTRALIA ANTIGEN IN THE REGION WEST OF QUEBEC. *(Fr.)* Guevin, R. M.; Brown, G.; Taliano, V. (Red Cross Transfus. Cent., Montreal, Canada). *Rev. Fr. Gastroenterol.* (97):53-58, 1974.

4894 EVOLUTION OF ISOENZYMES OF LACTATE DEHYDROGENASE DURING VIRAL HEPATITIS (A STUDY OF 130 CASES). *(Fr.)* Laverdant, C.; Bon, R.; Cristau, P.; Essioux, H.; Molinie, C.; Kassem, A.; Gendron, Y.; Jezequel, Y. (Serv. Gastroenterol., HIA Begin, Saint-Mande, France). *Ann. Gastroenterol. Hepatol. (Paris)* 10(5):389-399, 1974.

4895 EXTRACORPOREAL PERFUSION OF PIG LIVER IN THE TREATMENT OF HEPATIC COMA. *(It.)* Zucchetti, F.; Butti, A.; Fianchini, A.; Pigliucci, G. M.; Bianco, A. (Clin. Gen. Med. Med. Ther., S. Coure Cathol. Univ., Rome, Italy). *Chir. Patol. Sper.* 21(1):63-79, 1973.

4896 PRELIMINARY RESULTS ON THE RECOVERY OF THE AUSTRALIA ANTIGEN FROM FECES AND URINE OF PATIENTS WITH VIRAL HEPATITIS AND OTHER LIVER DISEASES. *(It.)* Zacchi, T. (United Hosp., Trieste, Italy). *Boll. Soc. Ital. Cardiol.* 53(1):52-58, 1974.

4897 HISTOLOGICAL ASPECTS OF THE INTESTINAL MUCOSA IN ACUTE AND CHRONIC HEPATITIS. *(It.)* Pastore, G.; Buongiorno, R.; Dentico, P.; Fera, G.; Schiraldi, O. (Inst. Inject. Dis., Univ. Bari, Italy). *Boll. Ist. Sieroter. Milan.* 53(2):402-414, 1974.

4898 HISTOLOGICAL CHANGES OF HEPATOCYTES AS A POSSIBLE SIGN FOR CARRIER OF HB-ANTIGEN. *(Ger.)* Korb, G.; Huppertz, A. (Weiden Munic. Hosp., Upper Palatinate, Germany). *Klin. Wochenschr.* 52 (23):1132-1133, 1974.

See also, 4285, 4793, 4846, 4925.

LIVER AND BILIARY TRACT

Chronic Hepatitis

4899 CLOTTING AND FIBRINOLYTIC ACTIVITY OF BLOOD IN CHRONIC LIVER DISEASE. *(Pol.)* Kaniak, J.; Kotschy, M.; Kowal-Gierczak, B.; Plamieniak, L. (Acad. Med., Wroclaw, Poland). *Pol. Tyg. Lek.* 29(38): 1621-1624, 1974.

The blood clotting system and fibrinolysis were investigated in 60 patients with chronic liver disease. These patients consisted of 30 with liver necrosis, 15 with chronic hepatitis, and 15 with liver metastases of malignant neoplasms. Patients with cirrhosis showed reduced blood clotting and increased fibrinolytic activity (decrease in fibrinogen, prothrombin, factors VII and IX, a prolonged Stypven-cephalin time, low plasminogen values, shortened fibrinolysis time, and reduced values for antiplasmin and antithrombin). Patients with liver metastases showed increased blood clotting and decreased fibrinolytic activity, as indicated by increased serum thromboplastic activity in the Biggs-Douglas test: increased values of prothrombin and fibrinogen; somewhat low values for plasminogen; and a prolonged fibrinolysis time. Results in patients with chronic hepatitis were not specific and were in the lower normal range. Low values for prothrombin, factors VII and IX, and fibrinogen could be a manifestation of decreased synthesis by injured liver cells. Low values of fibrinogen, plasminogen, antiplasmin, and antithrombin could also result from intensified activation of fibrinolysis often observed in chronic liver disease.

4900 SYSTEMIC MANIFESTATIONS ASSOCIATED WITH CHRONIC AGGRESSIVE HEPATITIS. *(Fr.)* Geubal, A. (Saint-Pierre Univ. Clin. Louvain, Belgium). *Acta Gastroentero. Belg.* 37(4-5):192-206, 1974.

A retrospective study was made of 53 patients with histologically confirmed chronic aggressive hepatitis from clinical, serological, and pathological information available when the hepatitis was diagnosed or later. Systemic manifestations occurred more than twice as often in women (21 of 28) as in men (9 of 25). The most common systemic manifestations involved the skin (19 cases) and joints (15), but they were also found in the endocrine system (9 cases), kidneys (4), blood (3), gastrointestinal tract (2), lymphatic system (2), muscles (1), heart (1), and pleura and pericardium (1); 3 patients had paraproteinemia. Associated disorders consisted of clinical or preclinical diabetes (18 cases), neuropsychiatric disorders (8), peptic ulcer (5), and allergies (8). The severity of systemic manifestations was not related to the extent of liver malfunction nor to immunoglobulin levels. Antithyroid antibodies were detected in 62% of the patients, antigastric antibodies in 28%, and Australia antigen in 9 of the 30 studied. The severity of systemic manifestations was greatest in patients who were negative for Australia antigen on serum immunoelectro-osmophoresis. It was confirmed that anti-smooth muscle antibodies and Australia antigen are not found in the same patient, and antinuclear factor was associated with Australia antigen in only 1 case. Total hemolytic complement and B_1A globulin levels were significantly decreased in patients with systemic manifestations. No correlation was found between B_1A globulin concentrations and the Australia antigen titer. Complement titers were affected both by the extent of liver malfunction and by the existence of systemic lesions, particularly renal ones. In most patients, complement titers decreased during exacerbations of chronic aggressive hepatitis. The extrahepatic lesions found in these patients and the associated serological anomalies suggest that chronic aggressive hepatitis is an autoimmune disease.

4901 CELLULAR AND HUMORAL IMMUNITY TO HEPATITIS-B SURFACE ANTIGEN IN ACTIVE CHRONIC HEPATITIS. *(E.)* Lee, W. M.; Reed, W. D.; Mitchell, C. G.; Galbraith, R. M.; Eddleston, A. L. W. F.; Zuckerman, A. J.; Williams, R. (King's Coll. Hosp. Med. Sch., London, England). *Br. Med. J.* 1(5960):705-708, 1975.

Although hepatitis-B surface antigen (HB_sAg) may be persistently present in the serum in a few cases of active chronic hepatitis, the cause of the disease in most patients in unknown. Studies carried out on 39 HB_sAg-negative patients with active chronic hepatitis revealed the presence of cell-mediated immunity to HB_sAg in 24 (62%), suggesting a high frequency of previous infection with hepatitis-B virus. Hepatitis-B surface antibody was detectable by ra-

ioimmunoassay in six patients, in all of whom HB$_s$Ag
omplexes were present in the serum on electron mi-
roscopy. Patients with HB$_s$Ag-positive active chron-
c hepatitis (12) were also studied and eight, in-
luding all those untreated at the time, showed a
ellular response to the antigen. Evidence of sen-
itization to a liver-specific cell surface lipopro-
ein was found with similar frequency in both groups.
hese results are consistent with the hypothesis that
epatitis-B virus is important in initiating the
isease in many cases of active chronic hepatitis
nd that sensitization to the liver cell membrane
ntigen is the autoimmune process responsible for
erpetuation of the liver injury.

902 HAEMOLYTIC COMPLEMENT, ANTICOMPLEMENTARY ACTIVITY AND HEPATITIS B ANTIGEN IN SERA
F PATIENTS WITH CIRRHOSIS OF THE LIVER. *(E.)* Kel-
ar, S. S.; Karhade, N. V.; Kotwal, S. E. (Med. Coll.,
urangabad, India). *Indian J. Med. Res.* 63(1):41-44,
975.

era from 50 patients with liver cirrhosis (34 men
nd 16 women, mean age 34.5 yr) were studied for the
resence of hepatitis B antigen (HB Ag), anticomple-
entary activity, and level of hemolytic complement.
he latter two tests were done within 2 hr of sample
ollection to reduce artifacts. Of the 50 sera, 15
amples (30%) showed HB Ag by the immunoelectroosmo-
horetic technique but none contained hepatitis B
ntibody (HB Ab). Only two patients showed anticom-
lementary activity; both were negative for HB Ag
nd HB Ab. In the remaining 48 cases, hemolytic com-
lement levels (mean 3.6 U) were significantly lower
han levels (mean 7.2 U) in sera from 25 healthy con-
rols. Further analysis showed that the hemolytic
omplement levels were significantly reduced in both
B Ag-positive and negative cases compared with nor-
al controls. Differences in complement levels be-
ween the HB Ag-positive and negative groups were not
ignificant. Reduction of hemolytic complement may
e due to reduced synthesis by the damaged liver or
o its utilization in possibly pathogenic mechanisms.
t is postulated that the first view is correct and
hat a cell-mediated response is involved in hepatic
amage in HB Ag-associated cirrhosis.

903 SERUM IMMUNOGLOBULINS AND ANTIBODIES IN RELATIVES OF PATIENTS WITH CHRONIC ACTIVE
EPATITIS (CAH). *(E.)* Chiaramonte, M.; Borrelli,
.; Sturniolo, G. C.; Fagiolo, U.; Naccarato, R. (Inst.
ed. Pathol., Univ. Padua, Italy). *Rend. Gastroen-
erol.* 6(3):205-206, 1974.

n an attempt to determine if a familiar abnormality
f the immune response is involved in the develop-
ent of chronic active hepatitis from acute hepa-
itis, 78 close relatives of nine patients with chron-
c hepatitis (five HB Ag-positive and four HB Ag neg-
ative) were investigated for HB Ag (counterelectro-
horesis), serum immunoglobulins (radial immunodif-
fusion), antinuclear and anticytoplasma antibodies
RA-latex test), OCT, serum albumin and γ-globulin.
ll relatives were HB-negative. Serum antibodies
ere not significantly increased compared with con-
rols. Immunological changes were found only in families of two HB Ag-positive and two HB Ag-negative patients. Mild biochemical changes were also evident in some subjects.

4904 ASYMPTOMATIC AUTOIMMUNE LIVER DISEASE IN SCLERODERMA. *(E.)* Gupta, M. M.; Warnes, T. W.; Watson, L. (Univ. Coll. Hosp., London, England). *Postgrad. Med. J.* 51(593):185-189, 1975.

A case of scleroderma with asymptomatic autoimmune liver disease is reported. The 54-yr-old female patient presented with features of CRST syndrome (calcinosis, Raynaud's phenomenon, sclerodactyly, and telangiectasia). Routine investigation revealed elevated plasma alkaline phosphatase (63 King-Armstrong U/100 ml). Separation of the isoenzymes of alkaline phosphatase by electrophoresis on polyacrylamide gels showed that the elevated enzyme was of hepatic origin; the presence of antimitochondrial, antinuclear, and smooth muscle antibodies in the serum suggested an associated autoimmune liver disease, which was confirmed by liver biopsy. Biopsy showed slight cholestasis and inflammatory cell infiltration around the portal system with bile ductule proliferation and reticulin increase extending into lobules. The histologic appearance was compatible with active chronic hepatitis progressing to cirrhosis. Routine measurement of serum alkaline phosphatase in all patients with scleroderma is indicated as a simple screening procedure for autoimmune liver disease.

4905 IMMUNOSUPPRESSIVE THERAPY IN CHRONIC HEPATITIS IN CHILDREN. *(E.)* Rabenda, C.; Rudkowski, Z. (Med. Acad., Wroclaw, Poland). *Mater. Med. Pol.* 6(3):202-206, 1974.

After failure of corticotherapy, six children (aged 2-9 yr) with chronic hepatitis were treated with immunosuppressive drugs (6-mercaptopurine, cyclophosphamide, and azathioprine). Permanent remissions lasting from 2 months to 4 yr were obtained in five cases. No side effects of the drugs were observed apart from moderate leukopenia and thrombocytopenia. Infections were not more frequent or more severe in the treated children. Varicella in one child ran a mild course. Case reports are presented for three children treated with 6-mercaptopurine followed by cyclophosphamide (0.5-1.0 mg/kg/day) or cyclophosphamide plus aziothioprine (0.8 mg/kg/day). 6-Mercaptopurine was without effect in one child who subsequently responded to cyclophosphamide therapy. Liver and spleen decreased in size as early as 2 weeks after immunosuppressive therapy, followed by disappearance of antinuclear antibodies from the serum and reversion of biochemical indexes to normal. Further trials of immunosuppressive therapy in children with chronic hepatitis appear warrented.

4906 IMMUNOSUPPRESSIVE TREATMENT OF CHRONIC HEPATITIS. *(Pol.)* Stempien, R.; Bergiel, A.; Fabianowski, J. (Acad. Med., Lodz, Poland). *Pol. Tyg. Lek.* 29(37):1583-1586, 1974.

A total of 29 patients (12 women and 17 men, aged 30-50 yr; av. 43.6 yr) with confirmed chronic hepatitis were treated with azathioprine (100-150 mg/day for 2-4 weeks followed by a maintenance dose of 50 mg/day) and prednisolone (15-20 mg/day). The duration of therapy ranged from 6-14 months; most patients are still being treated. The progress of disease was arrested in 23 of the 29 patients, and in some cases a complete remission was obtained. Marked clinical and biochemical improvement occurred in 6, some improvement in 17, no change in 5, and deterioration in 1. A decrease in hepatomegaly was observed in 20 of 29; of splenomegaly in 12 of 14; of ascites in 4 of 4; disappearance of telangiectasia in 5 of 10; and of palmar erythema in 5 of 13. Bilirubin levels returned to normal in 11 of 16 and improved in 2; albumin levels in 6 of 14 and 2 of 14, resp.; protein levels in 4 of 7 and 1 of 7, resp.; gamma globulin in 6 of 29 and 10 of 19, resp.; the thymol turbidity test in 7 of 29 and 13 of 29, resp.; and SGPT in 18 of 25 and 4 of 25, resp. Viral hepatitis preceded the disease in 24 cases; in 19 cases it occurred 4-18 months before immunosuppressive therapy was instituted. There were no serious side effects of treatment: 6 patients had brief episodes of upper respiratory infection and 10 showed transient decreases in the WBC or platelet count.

4907 ALPHA-MERCAPTOPROPIONYLGLYCINE (THIOLA) IN THE TREATMENT OF CHRONIC LIVER DISEASES. *(It.)* Nuti, M. (Italian Cent. Gastroenterol., Univ. Rome). *Policlinico. Sez. Med.* 81(1):55-62, 1974.

4908 COMPARATIVE ELECTRON MICROSCOPE INVESTIGATIONS IN CHRONIC PERSISTENT AND CHRONIC AGGRESSIVE HEPATITIS. *(Pol.)* Biczysko, W.; Meissner, R.; Zengteler, G.; Juszczyk, J. (Acad. Med., Poznan, Poland). *Pol. Arch. Med. Wewn.* 52(3):229-238, 1974.

4909 SURGICAL THERAPY OF CHRONIC HEPATITIS. *(Rus.)* Milonov, O. B.; Movchun, A. A. (I. M. Sechenov 1st Moscow Med. Inst., USSR). *Khirurgiia (Mosk.)* (9):67-71, 1974.

4910 BIO- AND IMMUNOLOGICAL STUDIES IN A CASE OF CHRONIC ACTIVE HEPATITIS IN A 12 YEAR OLD CHILD. *(Fr.)* Storcz, J.; Baumgartner, I.; Fulop, T.; Otvos, I.; Par, A.; Kaiser, E. (Pediatr. Clin., Pecs, Hungary). *Pediatrics* 10(46):49-58, 1974.

4911 CLINICAL SIGNIFICANCE OF MULTIPLE PROJECTION HEPATOSCANNING IN CHRONIC HEPATITIS. *(Rus.)* Sukirno, M. S.; Suchkov, A. V.; Iudin, L. A. (I. M. Sechenov 1st Moscow Med. Inst., USSR). *Klin. Med.* 52(8):107-113, 1974.

See also, 4265, 4266, 4793, 4801, 4802, 4871, 4897, 4923, 5099.

LIVER AND BILIARY TRACT

Alcoholic Liver Disease

4912 HOST FACTORS CAUSING INCREASED SUSCEPTIBILITY TO INFECTION IN PATIENTS WITH LAENNEC'S CIRRHOSIS. *(E.)* Andersen, B. R. (Abraham Lincoln Sch. Med., Univ. Illinois, Chicago). *Ann. NY Acad. Sci.* 252:348-352, 1975.

Infection is one of the common precipitating factors of hepatic coma in patients with cirrhosis and is the immediate cause of death of about 1/2 of patients with Laennec's cirrhosis. Facets of the host-defense mechanisms that appear to be most important in preventing the pyogenic infections that predominate in cirrhotics are the reticuloendothelial system, antibodies, complement, and neutrophilic granulocytes. Current knowledge about the functional capacity of these systems in cirrhotics is reviewed with emphasis on the complement system. Granulocytes of cirrhotic patients apparently have no significant functional defect and there is clearly no deficiency in antibodies function. Studies of reticuloendothelial function in cirrhotic rats demonstrated that i.v. injected bacteria were normally cleared from blood, although there was a delay in bacterial killing in the animals. A study of 12 cirrhotic patients at a VA hospital showed a decrease in complement components, especially C3 (7/12), C4 (1/2), and C3 proactivator (4/12). Of 11 patients tested for total hemolytic complement, eight had below-normal levels. These complement deficiencies may provide a less than optimal chemotactic and phagocytic stimulus for the granulocytes of the cirrhotic patient. The poor chemotactic response of the patients to their own serum was initially attributed to the depression of complement components. However, normal serum added to patient serum did not correct the problem. A serum inhibitor of chemotaxis was demonstrated in most patients with advanced Laennec's cirrhosis; the inhibitor was quite labile and quickly lost at room temperature.

4913 FOLATE DEFICIENCY IN THE ALCOHOLIC - ITS RELATIONSHIP TO CLINICAL AND HAEMATOLOGICAL ABNORMALITIES, LIVER DISEASE AND FOLATE STORES. *(E.)* Wu, A.; Chanarin, I.; Slavin, G.; Levi, A. J. (Northwick Park Hosp., Harrow, England). *Br. J. Haematol.* 29(3):469-478, 1975.

Clinical and laboratory observations were made on 84 patients (56 men and 28 women, aged 27-78 yr) regularly taking more than 80 g of alcohol/day. Macrocytosis was present in 84.5%, but only 13% were anemic. Of 57 bone marrow samples, 27 were abnormal, and 20 showed megaloblastic changes, most-

mild in degree. Serum, RBC, and liver folate
vels were reduced in 28%, 35%, and 31% of the pa-
ents, resp. Liver folate deficiency was more
vere in those patients, more often female, who
l inadequate diets or drank wine and spirits
ther than beer. The amount of alcohol consumption
l extent of liver damage did not affect folate
atus. These findings suggest that folate defi-
ency is common among alcoholics in England. How-
er, this study emphasizes that alcohol can cause
crocytic and megaloblastic changes by two separate
chanisms, one secondary to folate deficiency,
other by a direct toxic effect. The direct toxic
fect plays a more significant role in alcoholics
o take an adequate diet, as did most of the pa-
ents in this study. Many of the patients had
crocytosis, sometimes with megaloblastosis, in
e absence of folate deficiency, emphasizing the
rect toxic effect of alcohol on the developing
ythroblast. The findings of this study are not
mpatible with the suggestion that negative folate
lance always precedes megaloblastic conversion.

14 THE IgA/TRANSFERRIN RATIO IN CIRRHOSIS: DIAGNOSTIC AND PROGNOSTIC SIGNIFICANCE.
.) Fruchart, J. C.; Jaillard, J.; Sezille, G.;
ris, J. C.; Rault, C.; DeBuire, B. (Munic. Hosp., Lille, France). *Nouv. Presse. Med.* 3(28):1751-1752, 1974.

4915 CHYLOMICRONEMIA INDUCED BY ALCOHOL IN TYPE IV HYPERLIPOPROTEINEMIA. *(Fr.)* Brun, D.; Moorjani, S.; Lupien, P. J.; Belanger, G. (Laval Univ. Hosp. Cent., Quebec, Canada). *Rev. Fr. Gastroenterol.* (97):21-23, 1974.

4916 CHOLESTASIS IN ALCOHOLIC HEPATITIS. *(Ger.)* Brunner, H. (Med. Clin. II, Univ. Vienna, Austria). *Leber Magen Darm* 4(1):32-36, 1974.

4917 AUTOIMMUNE PHENOMENA IN ALCOHOLIC CIRRHOSIS. *(E.)* Zinneman, H. H. (Minneapolis VA Hosp., Minn.). *Am. J. Dig. Dis.* 20(4):337-345, 1975.

See also, 4780, 4787.

LIVER AND BILIARY TRACT

Cirrhosis

18 INTRAVENOUS VASOPRESSIN IN PATIENTS WITH PORTAL HYPERTENSION: ADVANTAGES OF CON-
NOUS INFUSION. *(E.)* Thomford. N. R.; Sirinek, K.
(Ohio State Univ. Coll. Med., Columbus). *J. Surg.*
s. 18(2):113-117, 1975.

ntinuous infusion and bolus injection of vasopres-
n were compared in reduction of portal vein pres-
re and adverse hemodynamic side effects. The stu-
included seven patients with Laennec's cirrhosis
o had hemorrhages from esophageal varices. Poly-
hylene catheters were inserted into the portal
in, superior vena cava, and one radial artery to
nitor pressures and determine cardiac output. Af-
r 72 hr each patient was daily stabilized for 30-
min and tested for 60 min for the hemodynamic ef-
cts of the vasopressin. Recordings were made at
5, 15, 30, 45, and 60 min. Bolus administration
nsisted of 15 U lysine-vasopressin in 100 ml 5%
xtrose given in 5 min. Infusion consisted of 0.4
lysine-vasopressin/ml 5% dextrose at 100 ml/hr.
e two types of administration were alternated dai-
. The bolus injections caused severe cramping and
dominal pain within 60 sec, and prompted defeca-
on and urination within 5 min, as well as causing
usea in all patients. Premature arterial contrac-
ons occurred in seven patients and persisted as
ng as 30 min. During the injection, systolic pres-
re increased briefly from 117 to 138 mm Hg. A
gnificant brachycardia occurred and persisted for
min. Average portal pressure decreased from 366
saline to 294 mm saline after 5 min and gradually
increased to 315, 329, and 341 mm after 15, 30 and 60 min, resp. Average cardiac output decreased from 6.7 to 5.6 liters/min at 30 min and was still significantly decreased after 60 min. Continuous infusion caused minimal to moderate abdominal cramping within 2 min and prompted defecation and urination within 5 min. Three became nauseated and three had occasional premature artrial contractions. Systolic pressure increased transiently during the first 5 min from 121-142 mm Hg. Brachycardia occurred within 5 min and persisted for 60 min. Average portal pressure decreased from 365 to 280, 269, and 261 mm saline at 5, 30, and 60 min, resp. Average cardiac output decreased from 6.1 liters/min to 4.8 liters/min at 5 min, but after this, values rose to a less than significant output reduction. Portal vein reduction pressures at 15, 30, 45, and 60 min were significantly lower after infusion than after bolus injection. It is concluded that infusion causes significantly greater reduction of portal pressure, less discomfort, and less reduction in cardiac output than bolus injection.

4919 THE EFFECT OF DIURETIC TREATMENT ON RED CELL AND PLASMA SODIUM CONCENTRATION IN PATIENTS WITH HEPATIC CIRRHOSIS AND ASCITES. *(E.)* Afifi, F. (INSERM, Beaujon Hosp., Clichy, France). *Biomedicine* 23(2):68-72, 1975.

The sodium content of RBC and plasma in 10 patients with hepatic cirrhosis and ascites was measured before, during, and after diuretic treatment. The results were compared with findings in 37 normal subjects and 42 untreated cirrhotic patients with ascites. Before diuretic treatment the mean RBC sodium content in the 10 patients with ascites was 9.95 mEq/kg; expressed as mEq/kg dry weight and mEq/kg RBC water, the sodium content was 27.15 and 15.02, resp. During diuretic treatment, the mean RBC sodium content decreased significantly to 6.27 mEq/kg, 18.85 mEq/kg dry weight, and 10.15 mEq/kg RBC water. The mean pretreatment plasma sodium concentration was 135.95 mEq/kg, which significantly decreased during treatment to 129 mEq/kg. After cessation of diuretic treatment and the disappearance of ascites, RBC and plasma sodium levels returned to normal. *In vitro* ^{22}Na exchange between plasma and RBC of cirrhotic patients with ascites remained unmodified during diuretic treatment. These results indicate that RBC in patients with cirrhosis complicated by ascites are a parameter of intracellular sodium retention. Their increased sodium content is diminished by diuretic treatment.

4920 ADDITIONAL DATA ON HEPATIC FUNCTION TESTS IN CYSTIC FIBROSIS. *(E.)* Feigelson, J.; Pecau, Y.; Cathelineau, L.; Navarro, J. (Trousseau Hosp., Paris, France). *Acta Paediatr. Scand.* 64(2): 337-344, 1975.

Over a 3-yr period, various liver function tests were performed on 50 patients (20 men and 30 women, aged 1-26 yr) with cystic fibrosis, of whom nine had multilobular cirrhosis. Tests indicating cytolysis, cholestasis, and cellular insufficiency were carried out together with measurements of serum prothrombin and immunoglobulins. Test results were generally abnormal in the patients with cirrhosis. Two distinct biochemical types of cirrhosis were distinguished, one clearly cholestatic and the other a more cellular type. The first type was characterized by elevated γ-glutamyl transpeptidase levels, significant cytolysis with raised ornithine transcarbamylase and B_{12} levels, normal IgA, and normal or high transferrin levels giving an IgA:transferrin ratio of less than 1.0. The second type of cirrhosis was characterized by consistently high IgA levels with normal or low transferrin levels giving an IgA:transferrin ratio greater than 1.9. Of the noncirrhotic patients, 50% showed a temporary increase of cytolysis (elevated ornithine transcarbamylase and B_{12} levels) and cholestasis (elevated leucine aminopeptidase). Three of the 50 patients, including one with cirrhosis, developed viral hepatitis. In those without cirrhosis, all tests returned to normal and remained so for more than 2 yr. It is concluded that hepatic disfunction remains merely latent in cystic fibrosis.

4921 AN ATYPICAL CYTOPLASMIC ANTIBODY IN CHRONIC LIVER DISEASES. DETECTION BY INDIRECT IMMUNE FLUORESCENCE. *(Ger.)* Storch, W. (Med. Clin., Karl-Marx Univ. Leipzig, Germany). *Z. Inn. Med.* 29 (22):940-942, 1974.

Sera from 400 patients with chronic liver diseases (cirrhosis, chronic aggressive hepatitis), and from 400 normal subjects were tested for an atypical cytoplasmic antibody by indirect immune fluorescence, using rat kidney slices as an antigenic substrate for incubation. Atypical cytoplasmic antibody was found in 12 patients with chronic liver diseases, in one normal subject, and titers over 1:400 were found in four patients without liver disease. No sex-specific differences in the occurrence were established. The occurrence of the antibody was highest in patients with liver cirrhosis. Australia antigen was usually absent. There was no correlation between the occurrence of the atypical cytoplasmic antibody and the seriousness of the disease. Fluorescence exclusively of the proximal tubular epithelium was found. The typical pattern of the fluorescence clearly differed from those observed in the presence of other antibodies. The antibody is not specific of the species, and belongs to the IgG fraction. A single absorption on liver mitochondria and microsomes did not suppress the fluorescence.

4922 HEPATIC ARTERIES AND ARTERIAL CIRCULATION IN LIVER CIRRHOSIS. *(E.)* Takahashi, T.; Tezuka, F. (Tohoku Univ. Sch. Med., Sendai, Japan). *Tohoku J. Exp. Med.* 113(2):113-128, 1974.

Hepatic arterial circulation in normal and cirrhotic livers was analyzed by morphometrical treatment of the arterial system. Autopsy materials obtained from 32 cases of liver cirrhosis, three cases of Banti's syndrome, and 98 control cases were used. The cirrhotic group included postnecrotic and portal annular cirrhosis; biliary cirrhosis and cirrhosis with primary hepatic carcinoma were excluded. Arterial blood flow of the liver was estimated from the radius R_t of the proper hepatic arteries. The arterial flow Q was calculated from the equation $Q = q \cdot R_t^n$, where q and n are the organ-independent constants of the arterial system. The mean arterial flow Q in cirrhotic livers was significantly larger than in normal livers, and there was a striking individual difference in Q in cirrhotic livers. Arterial flow Q was closely correlated with the volume of interstitial tissue, but not with the volume of parenchymal tissue, in cirrhotic livers. In Banti's syndrome, the estimated hepatic arterial flow was within the normal range. It is concluded that the increased supply of arterial blood in liver cirrhosis was due solely to abundant intrahepatic shunts. Compensation of decreased portal flow by increased arterial supply was improbable.

4923 PLASMA AND RED BLOOD CELL PHOSPHOLIPIDS IN CHRONIC LIVER DISEASES. *(E.)* Cantoni, L.; Curri, S. B.; Andreuzzi, P.; Rocchetti, P. (Hosp. Maggiore Ca' Granda, Milan, Italy). *Clin. Chim. Acta* 60(3):405-408, 1975.

Total phospholipid levels and levels of phosphatidylcholine, lysophosphatidylcholine, phosphatidylethanolamine and phosphatidylserine, and sphingomyelin were determined in the plasma and RBC of 58 patients with chronic liver disease and 12 controls by quantitative extraction and thin-layer chromatography. The liver disease in 12 patients with cirrhosis was compensated, in 41 decompensated, the remainder having chronic aggressive hepatitis. Total phospholipid levels were significantly reduced in both the plasma and RBC of the patients with chronic liver disease, as compared with controls. Plasma sphingomyelein was significantly decreased in liver disease, while RBC showed a marked increase in lysophosphatidylcholine and a significant decrease in phosphatidylethanolamine and phosphatidylserine. It is suggested that in chronic liver disease, RBC lipid disturbances follow more closely those of the hepatocyte than those in plasma.

4924 ANTIBODY TITRE CHANGES AND SKIN REACTIVITY IN PATIENTS WITH LIVER CIRRHOSIS UNDERGOING PORTOCAVAL SHUNT OPERATION. *(E.)* Johansen, K. S.; Johansen, T. S.; Leerhoy, J. (State Serum Inst., Copenhagen, Denmark). *Acta Med. Scand.* 197(3):225-228, 1975.

Antibody titers to common antigens, and cell mediated immunity, were studied in cirrhotic patients undergoing portocaval shunts. Sera were collected from 10 patients with alcoholic and post-necrotic liver cirrhosis, and examined for HI antibodies to rubella and vaccinia, and CF antibody to cytomegalovirus. Normal blood donors (21) served as controls. Antistreptolysin O, antistreptococcal hyaluronidase, diptheria toxoid, *Candida* precipitin, syphilis reactions, *Salmonella typhi* O and H and *S. paratyphi* O and H were also determined. Skin tests were performed with *Candida albicans* extract, diptheria toxoid B antigen, streptokinase and tuberculin. Eight patients undergoing cholecystectomy served as controls for the skin tests, and for antibody titers to diptheria toxoid and *Candida albicans precipitins*. The rubella (7/10) and vaccinia (8/10) HI antibodies, diptheria (6/10) antitoxin, and antistreptolysin O (3/10) titers were significantly higher in cirrhotics than in controls (5/21, 2/13, 0/8, and 0/21, resp.). Total number of elevated antibody titers was 36 of 140 as opposed to 9 of 194 in the controls. About one month after the portocaval shunt, eight of the 10 patients had a positive titer index and none was negative. In one patient after surgery, rubella and vaccinia titers jumped from 20 to 160 and from 32 to 256, resp. The skin test reactions to the four antigens used were lower in the cirrhotics than in the controls, though significantly only with the diphtheria toxoid and streptokinase. After portocaval shunt, mean antibody titers increased with a concomitant decrease in skin test reactions, while there were no titer changes and normal indurational increases after cholecystectomy. It is concluded that elevated antibody titers to many common bacterial, fungal, and viral antigens are found in cirrhotic patients.

4925 THE ROLE OF IMMUNOLOGIC FACTORS IN THE PATHOGENESIS OF CHRONIC ACTIVE HEPATITIS. *(Pol.)* Bergiel, A. (Med. Acad., Lodz, Poland). *Przegl. Epidemiol.* 28(2):131-137, 1974.

Immunologic factors in progressive active hepatitis, primary biliary cirrhosis and cryptogenic cirrhosis are reviewed. Progressive hepatic diseases are frequently considered to be autoimmune diseases because of the absence of definite cause, more frequent occurrence among young women, chronic course with exacerbations, familial occurrence associated with other autoallergic diseases, hypergammaglobulinemia, high level of immunoglobulins, presence of autoantibodies in serum, presence of LE factor, lymphocytic infiltrations and positive response to treatment with immunosuppressive and glycocorticoid drugs. The role of T and B lymphocytes in the production of autoantibodies is discussed and stressed that both humoral and cell mediated immunity have to be considered in chronic liver diesease. Antibodies to smooth muscle have been detected in 39-50% of patients with progressive active hepatitis and in 50% of primary biliary cirrhosis; antimitochondrial antibodies in 25-30% and 83-93%, resp; antinuclear antibodies in 15-26% and 25%, resp. The role of Australia antigen (HB$_s$Ag) or its complexes in the pathogenesis of progressive hepatitis has not been elucidated but HB$_s$Ag-positive cases frequently have a different course and seem to have a better prognosis. "Mediolan" antigen, a lipoprotein, has been detected in serum when liver damage is present. It has been detected in 38% of patients with biliary cirrhosis, 26% of aggressive hepatitis and 30% of cryptogenic cirrhosis. Both HB$_s$Ag and "Mediolan" antigen show a negative correlation to other autoimmune factors such as antinuclear and anti-smooth muscle antibody levels and show no correlation to antimitochondrial antibodies. The role of humoral immunity and toxicity of circulating autoantibodies has not been established and their detection has only diagnostic significance in chronic liver diseases. Cell mediated immunity, on the other hand, seems to be important in the pathogenesis of these diseases. It is hypothesized that the T lymphocytes of subjects with normal cellular immunity can become sensitized to HB$_s$Ag antigen and attack liver cells containing HB$_s$Ag. Subjects with decreased cellular immunity become HB$_s$Ag carriers and show only slight liver damage.

4926 ANEMIA AND HEPATIC CIRRHOSIS. *(Sp.)* Musso, A. M.; Kremenchuzky, S.; Rochna Viola, E. M.; Burucua, J. E. (Jose de San Martin Hosp. Sch., Univ. Buenos Aires, Argentina). *Medicina (B. Aires)* 34(2):89-100, 1974.

4927 DIGESTIVE HEMORRHAGE IN THE CIRRHOTIC. *(Sp.)* Munoz Monteavaro, C.; Mescia, C. (Pereira Rossell Hosp., Montivideo, Uruguay). *Cir. Urug.* 44(4):278-288, 1974.

4928 PATHOGENESIS OF ASCITES FORMATION IN LIVER CIRRHOSIS. *(Ger.)* Arbeiter, G.; Meyer-Burg, J. (Med. Clin. Polyclin., Free Univ. Berlin, Germany). *Leber Magen Darm* 4(6):299-307, 1974.

4929 POSTERIOR MEDIASTINAL VENOUS MASSES IN PATIENTS WITH PORTAL HYPERTENSION. *(E.)* Moult, P. J. A.; Waite, D. W.; Dick, R. (R. Free Hosp., London, England). *Gut* 16(1):57-61, 1975.

4930 THE USEFULNESS OF THE GALATIN AND XYLOSE TOLERANCE TESTS IN INVESTIGATION OF DIGESTION AND ABSORPTION IN PATIENTS WITH CONGESTIVE LIVER CIRRHOSIS. *(Pol.)* Zydowicz, L.; Adamiak, T.; Chojnacki, J.; Kowalczyk, L. (Mil. Acad. Med., Lodz, Poland). *Pol. Arch. Med. Wewn.* 51(6):612-618, 1974.

4931 MEDICAL TREATMENT OF ASCITES. *(Fl.)* De Groote, J.; Deruyttere, M. (St. Raphael Acad. Hosp., Louvain, Belgium). *Tijdschr. Gastroenterol.* 17(2):94-102, 1974.

4932 LYMPHOVENOUS ANASTOMOSIS IN THE NECK OF PATIENTS WITH LIVER ASCITIC CIRRHOSIS. *(Rus.)* Shereni, P.; Madyar, Z.; Sabo, D. (Centr. Inst. Traumatol., Budapest, Hungary). *Khirurgiia (Mosk.)* (3):100-102, 1974.

4933 ADDITIONAL ARTERIALIZATION OF THE LIVER IN PORTACAVAL SHUNT. *(Rus.)* Burger, K.; Zimmerman, X. B.; Hubner, R.; Hagemann, E.; Munchov, R.; Tausch, V. (Sharite Med. Centr., Humboldt Univ., Berlin, Germany). *Khirurgiia (Mosk.)* (3):74-76, 1974.

4934 α_1-ANTITRYPSIN-DEFICIENCY: COMBINATION OF PULMONARY EMPHYSEMA AND LIVER CIRRHOSIS IN INFANCY. *(Ger.)* Kaiser, D.; Rennert, O. M.; Joller-Jemelka, H.; Gotze, H.; Sollberger, H.; Kehrli, P. (Pediatr. Clin., Univ. Bern, Switzerland). *Klin. Wochenschr.* 53(3):117-124, 1975.

4935 THE USE OF LACTULOSE IN THE TREATMENT OF CHRONIC PORTO-SYSTEMIC ENCEPHALOPATHY. *(Por.)* Sette, Jr., H.; Conte, V. P.; Bettarello, A. (Fac. Med., Univ. Sao Paulo, Brazil). *Arg. Gastroenterol.* 11(4):217-222, 1974.

4936 PRELIMINARY OBSERVATIONS OF HEMODYNAMICS IN CIRRHOTICS TREATED WITH L-DOPA. *(It.)* Cagossi, M.; Bianco, S.; Cagossi, M.; Butti, A.; Lojacono, L. (Inst. Gen. Clin. Surg. Surg. Ther., Sacra Cuore Cathol. Univ. Rome, Italy). *Chir. Patol. Sper.* 21(2):148-161, 1973.

4937 HEPATIC VENO-OCCLUSIVE DISEASE. TWO CASES IN QUEBEC. *(Fr.)* Auger, C.; Lefebvre, R. (Hotel Dieu, Montreal, Canada). *Rev. Fr. Gastroenterol.* (97):43-52, 1974.

4938 EMERGENCY TREATMENT FOR MASSIVE HEMORRHAGE FROM RUPTURED ESOPHAGEAL VARICES IN THE CIRRHOTIC PATIENT. *(Fr.)* Van Cangh, P. J.; Otte, J. B.; Mahieu, P.; Moriau, M.; Fiasse, R.; Kestens, P. J. (St. Pierre Clin., Cathol. Univ. Louvain, Belgium). *Acta Gastroenterol. Belg.* 37(6):259-272, 1974.

4939 END-TO-END CAVOSPLENIC ANASTOMOSIS FOR THE TREATMENT OF PORTAL HYPERTENSION IN CHILDREN. *(Ger.)* Burger, K.; Zimmermann, H. B.; Otto, H. H. (Charite Hosp., Humboldt Univ., Germany). *Zentralbl. Chir.* 99(41):1292-1295, 1974.

See also, 4264, 4266, 4308, 4429, 4618, 4741, 4793, 4801, 4802, 4807, 4814, 4837, 4838, 4881, 4899, 4902, 4914, 5090, 5099, 5184.

LIVER AND BILIARY TRACT

Gallbladder and Biliary Tract Diseases

4940 A TEST FOR PATENCY OF THE CYSTIC DUCT IN ACUTE CHOLECYSTITIS. *(E.)* Eikman, E. A.; Cameron, J. L.; Colman, M.; Natarajan, T. K.; Dugal, P.; Wagner, Jr., H. N. (Johns Hopkins Med. Inst., Baltimore, Md.). *Ann. Intern. Med.* 82(3):318-322, 1975.

A radioactive tracer procedure was used to evaluate the patency of the cystic duct in 39 patients with acute abdominal pain. The gallbladder is first stimulated to empty by i.v. injection of chloecystokinin (75 Ivy dog U). After 30 min, either ^{125}I-rose bengal (150 μCi) or ^{99m}Tc dihydrothioctic acid (2 mCi) are injected and accumulation of radioactivity in the liver and gallbladder regions is monitored by external gamma emission imaging. Diagnostically significant images were recorded between 60-90 min after injection of tracer. Ten patients who subsequently proved to have acute cholecystitis failed to accumulate gallbladder radioactivity. The remaining 29 patients with a variety of other diseases all showed visualization of the gallbladder. There were no significant side effects or complications of the procedure, and it is concluded that this technique may be a useful adjunct to the clinical and roentgenographic evaluation of patients with acute abdominal pain.

4941 BILIARY LIPID OUTPUT DURING THREE MEALS AND AN OVERNIGHT FAST. I. RELATIONSHIP TO BILE ACID POOL SIZE AND CHOLESTEROL SATURATION OF BILE IN GALLSTONE AND CONTROL SUBJECTS. *(E.)* Northfield, T. C.; Hofmann, A. F. (Mayo Clin., Rochester, Minn.). *Gut* 16(1):1-17, 1975.

Using a duodenal perfusion technique, the biliary output of bile acids, phospholipid, and cholesterol was measured hourly during 3 meals and an overnight fast in 7 white patients (3 men and 4 women, aged 42-69 yr) with radiolucent gallstones in a functioning gallbladder, and in 7 healthy controls without gallstones, closely matched for age, sex, and weight. Before the perfusion, bile acid kinetics were defined by an isotope dilution procedure, and the biliary lipid composition of fasting gallbladder bile was determined. Total daily biliary lipid output was similar in gallstone and control subjects, and was unrelated to cholesterol saturation of fasting gallbladder bile and to bile acid pool size. There was an inverse relation between the size and recycling frequency of the bile acid pool, so that secretion rate and hepatic return of bile acids remained constant, despite a wide range of pool sizes. The finding of a normal bile acid synthesis rate in subjects with a small pool size therefore indicated normal feedback regulation of bile acid synthesis. Hourly measurements of biliary lipid output showed a linear relation between bile acid and cholesterol output, with a similar regression line for gallstone and control subjects, but a non-linear relation between bile acid and phospholipid output. Consequently, samples from all subjects were consistently supersaturated with cholesterol at low bile acid outputs, especially during overnight fasting, but not at high bile acid outputs. These findings indicate that hepatic secretion of bile supersaturated with cholesterol is physiological in man at low bile acid outputs, that bile acid pool size is probably determined in part by its recycling frequency, and that cholesterol cholelithiasis in some whites may be due to an underlying extra-hepatic abnormality.

4942 EFFECT OF PHENOBARBITAL IN A CASE OF EXTRAHEPATIC CHOLESTASIS. *(E.)* Metreau, J. M.; Bismuth, H.; Franco, D.; Dhumeaux, D. (Hosp. Henri Mondor, Creteil, France). *Gastroenterology* 68(3): 567-571, 1975.

Treatment of an extrahepatic biliary obstruction in a 44-yr-old woman is described. The woman presented with jaundice and pruritus. For 2 weeks she had complained of nausea, headache, and asthenia and for 10 days had had moderate fever, pruritus, and vomiting. In the preceeding 6-month period she had taken at least 15 different drugs, including opipranol, indomethacin, diazepam, and sulfamethoxydiazine. Probable cholestatic hepatitis was diagnosed. She was discharged on cholestyramine alone, which was stopped after 2 days due to diarrhea. One month later she returned with icterus and pruritus: serum bilirubin was 10.0 mg/100 ml; alkaline phosphatase, 270 IU. Phenobarbital administration was started and slowly increased to 200 mg/day. After 1 week, pruritus and serum bilirubin levels diminished. After 1 month pruritis was reduced, serum bilirubin was 7.0 mg/100 ml. However, the serum alkaline phosphatase remained high at 240 IU. Phenobarbital was stopped. Two months later she suffered a progressive relapse of pruritus and jaundice. Serum bilirubin was 22.0 mg/100 ml; alkaline phosphatase, 660 IU; and total bile acids, 160 μg/ml. Biopsy revealed marked cholestasis and portal sclerosis containing numerous inflammatory cells with few polymorphonuclear leukocytes. Phenobarbital again lowered the pruritus and bilirubinemia and reduced bile acids to 51 μg/ml, but the alkaline phosphatase progressively increased to 1120 IU. Adenocarcinoma was diagnosed and a cephalic pancreatic duodenectomy (Whipple procedure) was sucessfully performed. The phenobarbital-induced decrease in pruritus, serum bilirubin, and bile acids suggests that this drug may be effective in extrahepatic cholestasis, possibly causing enhanced biliary secretion of cholephilic organic anions. It is noted that caution must be taken before interpreting this effect of phenobarbital as relecting the intrahepatic origin of a cholestasis.

4943 ACUTE EMPHYSEMATOUS CHOLECYSTITIS. *(E.)* Abengowe, C. U.; McManamon, P. J. M. (Gen. Hosp., St. John's, Canada). *Can. Med. Assoc. J.* 111 (10):1112-1113, 1974.

A 74-yr-old North American diabetic man with Indian ancestry was hospitalized with a 3-day history of acute, steady, progressive, right upper quadrant abdominal pain associated with nausea and vomiting for 48 hr. Laboratory findings were as follows: leukocyte count 15,000/mm^3, LDH 225 mU/ml, SGOT 76 mU/ml, total bilirubin 1.5 mg/deciliter, serum amylase 40 U/ml, urinary amylase 16 U/ml, fasting blood sugar 197 mg/deciliter, Hb 15 g/deciliter, Hct. 46%, and erythrocyte sedimentation rate 83 mm/hr. A plain film of the abdomen showed an ovoid gas shadow measuring 9 x 5 cm and situated high in the right hypochondrium, which was interpreted as representing gas in the gallbladder. A second plain film made 24 hr later showed the gas involving the gallbladder wall as well. A diagnosis of acute emphysematous cholecystitis was made and a gangrenous distended gallbladder removed at operation. *Clostridium perfringens* was cultured from the gallbladder contents and wall. A review of the literature indicated that acute emphysematous Cholecystitis is more prevalent among male diabetics. Its clinical and laboratory manifestations are similar to those of ordinary acute cholecystitis; diagnosis cannot be made preoperatively without radiologic studies. If acute emphysematous cholecystitis is suspected, it is suggested that intensive antimicrobial therapy and fluid and electrolyte replacement be given prior to early surgical intervention.

4944 EMPTYING OF THE HUMAN GALLBLADDER AND PREDISPOSITION TO GALLSTONE FORMATION. *(E.)* van der Linden, W. (Cent. Hosp., Ostersund, Sweden). *Tijdschr. Gastroenterol.* 17(2):121-128, 1974.

Oral cholecystography performed in patients in whom the gallbladder was visualized without revealing the presence of stones were repeated 30 min after the ingestion of a meal consisting of two egg yolks with sugar to assess the rate of gallbladder emptying. The films were reviewed to estimate gallbladder volume. The patients were separated into two groups, those with a sluggish and those with a vigorous postprandial contraction. In the sluggishly contracting group far more patients were under than over 45 yr of age. In the strong contraction group, more patients were over than under 45 yr of age. Women predominated in the sluggish group while in the other group there was no sex differentiation. During the 13-14 yr between the cholecystographies and this follow-up study, two men in the fibrous contracting group had been operated on for duodenal ulcer, four patients had been appendectomized, one cholecystectomized and two subjected to gynecological operations. In the sluggishly contracting group there were no gastric operations, four appendectomies, five cholecystectomies, one herniotomy and two gynecological operations. In 12 of the 35 patients who at follow-up could be traced to the sluggish group, cholecystography was repeated and signs of gallstone disease were present in seven. In the fast contraction group, x-ray examination was repeated in nine of the 36 patients who could be traced and gallstone disease was diagnosed in only one. In the sluggishly contracting group, gallstones were found significantly more often when cholecystography was performed some years later. The results of this study show that a sluggish contraction of the gallbladder after an egg yolk meal occurs particularly often in pre-menopausal women. The results further indicate that patients with such gallbladders are especially prone to develop gallstones in later life.

4945 THE CHOLECYSTOKININ TEST: AN ASSESSMENT.

(E.) Reid, D. R. K.; Rogers, I. M.; Calder, J. F. (R. Infirm., Glasgow, Scotland). *Br. J. Surg.* 62(4):317-319, 1975.

The significance of the cholecystokinin (CCK) test was investigated in 13 patients thought to have x-ray negative gallbladder pain. Duration of the symptoms ranged from 8 months to 10 yr. The patients were told they would be having a cholecystogram (all had one previously) during which they would receive an injection; they were not told the injection might provoke pain. Prone, prone-oblique, and erect films were taken 14 hr after ingestion of six iopanoic acid tablets. Cholecystokinin-pancreozymin was injected over a 1-min period and further films were taken after 2, 4, 6, 8, and 20 min. The injection of 1.5 Ivy U/kg CCK was done into the tubing of an i.v. saline infusion set-up behind the patient so that she was not aware of the moment of injection. The test was considered positive if typical pain was experienced within 10 min. In nine patients, surgery had been indicated clinically. Of these, four were test positive, four test negative, and one was equivocal. Of the four positive reactors, three were relieved by surgery; the fourth had a large functional overlay. Of the four negative reactors, three were relieved by surgery. The remaining patient may have had a small residual stone in the common bile duct after surgery. The patient with equivocal test results was relieved by surgery. Of the four non-operated patients, all were test negative. One was later given a truncal vagotomy and pyloroplasty for duodenal ulcer, but the pains continued. A 14th patient, not included in the series, presented with apparent biliary colic two yr after cholecystectomy gave a positive CCK test. Only three of the patients showed good gallbladder contraction in response to cholecystokinin. It is concluded that a positive test would indicate cholecystectomy while a negative test does not absolve the gallbladder as the source of pain.

4946 ROUX-EN-Y HEPATICJEJUNOSTOMY: A REAPPRAISAL OF ITS INDICATIONS AND RESULTS. *(E.)*

Stefanini, P.; Carboni, M.; Patrassi, N.; Basoli, A.; De Bernardinis, G.; Negro, P. (Univ. Rome Med. Sch., Italy). *Ann. Surg.* 181(2):213-219, 1975.

A critical evaluation was made of 131 patients (51 men and 80 women, aged 31-73 yr) submitted to choledocho- or hepaticojejunostomy. The main indications for hepaticojejunostomy were iatrogenic strictures of the common bile duct (60 patients), and choledocholithiasis with markedly dilated duct (41). The overall mortality rate was 4%, principally due to renal hepatic failure, bile peritonitis and bleeding. The complications following hepaticojejunostomy included only one case of biliary fistula which required reoperation. The long-term results of 80 patients available for a follow-up study were as follows: 63 patients (78.7%) were symptom-free at 2-13 yr after surgery; eight patients had brief episodes of cholangitis which responded to antibiotic and corticosteroid treatment; nine patients required reoperation for stricture of anastomosis. These overall results offer a strong argument for hepaticojejunostomy which, compared with choledochoduodenostomy, avoids the hazards of the so-called sump syndrome and of the reflux of enteric contents into the common bile duct. An increased incidence of peptic ulcer disease in the patients submitted to hepaticojejunostomy was not observed. In very high strictures and in reinterventions, anastomosis between left hepatic duct and Roux-en-Y jejunal limb was carried out. The results achieved with this technique in 26 patients were about the same following hepaticojejunostomy. Thus it is concluded that hepaticojejunostomy, as opposed to choledochoduodenostomy, be used in treating obstructions of proximal as well as distal common bile duct. Additionally, hepaticojejunostomy is advised as the most appropriate procedure in patients with choledocholithiasis and markedly dilated duct.

4947 ADENOCARCINOMA OF THE BILE DUCTS. RELATIONSHIP OF ANATOMIC LOCATION TO CLINICAL FEATURES.

(E.) Ingis, D. A.; Farmer, R. G. (Cleveland Clin., Ohio). *Am. J. Dig. Dis.* 20(3):253-261, 1975.

Case histories of 23 patients with adenocarcinoma of the bile ducts presenting over a 14-yr period were reviewed and a comparison made between carcinoma in the hepatic duct system and carcinomas in the common bile duct. In 14 patients (10 women and four men, aged 38-81 yr) the carcinoma arose in the hepatic duct system. In nine (seven women and two men, aged 44-82 yr) the carcinoma arose in the common bile duct. It was found that age, sex, presenting symptoms, physical examination, and laboratory findings were similar regardless of the location of the carcinoma. Moreover, the location did not influence whether the correct diagnosis was made at the initial operation as carcinomas in both locations, although present, were not found by surgeons at the time of the original operation. Percutaneous cholangiography, operative cholangiography, and endoscopic retrograde cholangiopancreatography were successful in making the diagnosis in both locations. Other preoperative tests, while showing obstructive jaundice at times, did not aid the surgeon prior to operative intervention. The tumors differed in pathology: hepatic duct carcinomas were often scirrhous; the more distal carcinomas were adenocarcinomas of varied grades. The location influenced the type of surgery. Resection was more common in the distal common bile duct cases. The average survival was less than 2 yr for both locations. In eight hepatic duct carcinoma patients 5-fluorouracil was given p.o. or i.v. weekly following surgery. In two patients cobalt therapy consisting of 2500 - 5000 rads locally to the area of the carcinoma was followed by 5-fluorouracil therapy. In one case, cobalt therapy of 2400 rads alone was given. These measures did not appear to increase the survival of these patients. In the patients with carcinoma of the common bile duct, only one received 5-fluorouracil and he lived only 2 months. Radiation was not used in any of these cases. In view of the poor prognosis for patients with these carcinomas, it is urged that attention be focused on means of earlier diagnosis.

4948 PERCUTANEOUS LIVER BIOPSY IN PATIENTS WITH LARGE BILE DUCT OBSTRUCTION. *(E.)* Morris, J. S.; Gallo, G. A.; Scheuer, P. J.; Sherlock, S. (R. Free Hosp., London, England). *Gastroenterology* 68(4):750-754, 1975.

The safety and diagnostic value of percutaneous liver biopsy were reviewed in 125 patients with large bile duct obstruction. Prior to biopsy, none had palpable gallbladder or suspected cholangitis. In two cases a Vim-Silverman needle was used; in the remainder, a Menghini needle. All patients received 10 mg vitamin K i.m. for 2 days before biopsy. For 24 hr after biopsy, patients were kept in bed, and pulse, temperature and blood pressure were recorded at regular intervals. The biopsy was considered to be diagnostic or suggestive of large bile duct obstruction when most of the following were found: central cholestasis; duct replication; expansion and edema of portal tracts with leukocyte infiltration; and bile infarction. Each patient's record was examined for initial clinical diagnosis, discharge or autopsy diagnosis, complications of liver biopsy, and operative findings. Serum bilirubin levels ranged from 5 to over 20 mg/100 ml, and in 42% jaundice had been present for over 6 months. Percutaneous cholangiography was attempted in 47 patients, and was successful in 38. Of the 125 patients, eight developed complications: biliary peritonitis (one); severe pain in the upper right abdomen (three); pyrexia and chills (two); pleural effusion and blood-stained ascites (one each). There was no apparent relation between development of complications and the depth of jaundice or the anatomical abnormality. Needle biopsy failed in two patients. In 103 cases, the initial biopsy showed changes compatible with large duct obstruction, in 16 the sole abnormality was cholestasis, and in six, results were unhelpful or misleading. Of 38 patients in whom the ducts were successfully punctured, 32 showed changes associated with large duct obstruction, and six cholestasis. It is concluded that needle biopsy is useful and safe to perform in patients with large duct obstruction; however, a careful prebiopsy work-up and close observation for 24 hr after biopsy are essential.

4949 CHOLECYSTECTOMY PEER REVIEW: MEASUREMENT OF FOUR VARIABLES. *(E.)* Mitchell, J. H.; Hardacre, J. M.; Wenzel, F. J.; Lohrenz, F. N. (Marshfield Clin., Wisconsin). *Med. Care* 13(5):409-416, 1975.

Patients undergoing uncomplicated cholecystectomy (222) were evaluated by both process and outcome methods, and their satisfaction and duration of postoperative stay were measured. Criteria for process analysis were: indications for admission; laboratory tests; length of postoperative stay; indications for discharge; and other components for a comprehensive medical record. Of the 222, 80 at random were used as the basis for this analysis. Outcome was divided into five types: asymptomatic and back-to-normal activities; symptomatic and back-to-normal activities; not back-to-work or normal activities; bedridden; and dead. Information was gathered from the medical records and patients answered a questionnaire to determine outcome status and satisfaction. After the analyses were completed, the patients were divided into those with bile duct exploration and those without. Each group was subdivided according to surgeon, and mean postoperative stay for each surgeon's patients calculated for each variable. The major omission found by process review was the absence of preoperative serum amylase test in eight of 18 patients with acute cholecystitis. In one instance there was no record of urinalysis or hematocrit. All had abnormal gallbladders documented by pathological reports. Outcome analysis results were within predicted expectations in four categories. In the symptomatic back-to-work group, however, there was 31% of the patients, in contrast to the predicted 13%. There were no statistical differences in length of postoperative stay among the surgeons of the bile duct exploration group. In contrast, the group given no such exploration showed a marked difference in stay among their surgeons. One surgeon kept patients an average of two days longer than another in the group. Of all the patients, 95% were satisfied with their care and 90% felt the length of their postoperative stay was appropriate. It is concluded that process outcome and patient satisfaction were satisfactory, and length of postoperative stay may be shortened.

4950 BILE ACID PATTERN OF GALLBLADDER AND HEPATIC BILE IN PATIENTS WITH AND WITHOUT CHOLESTEROL GALLSTONES. *(E.)* Arnesjo, B.; Bodvall, B.; Stahl, E. (Dep. Surg., Univ. Lund, Sweden). *Acta Chir. Scand.* 141(2):135-138, 1975.

Gallbladder bile acid pattern was compared in 18 patients with cholelithiasis and 13 with duodenal ulcer disease. Both gallbladder and hepatic bile specimens were taken after an overnight fast during cholecystectomy or selective proximal vagotomy.

Bile acids were immediately extracted with methanol acetone and separated by thin layer chromatography. Molar concentrations were determined, as well as the ratios of molar concentrations of glycine:taurine conjugated acids, trihydroxy:dihydroxy acids, cholate:deoxycholate, cholate:chenodeoxycholate, cholate plus deoxycholate:chenodeoxycholate and chenodeoxycholate:deoxycholate. In each case, hepatic bile molar ratios were divided by gallbladder bile molar ratios. The individual hepatic to gallbladder bile acid molar ratios were then compared with those of the control duodenal ulcer patients. The total bile acid concentration of the gallbladder bile in the controls (164.7) was higher than that of the gallstone group (122.9). There were no differences between the two groups in bile acid patterns, excepting a lower trihydroxy:dihydroxy ratio in the gallstone group. Individual hepatic to gallbladder relative molar ratios in the gallstone group had elevated trihydroxy:dihydroxy (1.35) and cholate:deoxycholate (1.47) ratios. It is concluded that gallbladder bile from gallstone patients has a diminished trihydroxy:dihydroxy molar ratio.

4951 GALL-STONES AND ORAL CONTRACEPTIVES. *(E.)* Howat, J. M. T.; Jones, C. B.; Schofield, P. F. (Park Hosp., Manchester, England). *J. Int. Med. Res.* 3(2):59-62, 1975.

Female patients (100) were studied to determine whether oral contraceptives increased risk of gallstone formation. Of these, 50 presented for surgery with gallstones, and 50 were controls admitted for minor surgery or as a result of trauma. A record was kept of those who had taken oral contraceptives for over six months at any time prior to admission. The number of pregnancies and miscarriages were recorded so the two groups could be matched for parity. Of the 50 gallstone patients, 35 (70%) had used contraceptives for at least six months, as compared to 14 (28%) of the controls, a highly significant difference. Parity and marital status did not differ between the groups. It is concluded that there is a markedly higher oral contraceptive use in gallstone patients than in normal controls.

4952 STUDIES ON BILE SALT DECONJUGATION FOLLOWING SMALL BOWEL BYPASS PROCEDURES. *(E.)* Wise, L.; Margraf, H.; Stein, T. (Washington Univ. Sch. Med., St. Louis, Mo.). *Ann. Surg.* 181(4):397-401, 1975.

The amount of bile salt deconjugation and malabsorption following small bowel bypass was studied, and the role of the glycine-1-^{14}C-cholic acid (^{14}C-GCA) test in evaluating the intestinal adaptive response and bypass adequacy was assessed. Patients (26) with morbid obesity had 35 cm of proximal jejunum anastomosed end-to-end to 10 cm of terminal ileum. Glycine-1-^{14}C-cholate was given p.o. and the specific activity of the expired $^{14}CO_2$ was determined to serve as an index of bacterial deconjugation. The ^{14}C content of 48-hr stool specimens following ingestion of the label served as a malabsorption index. These studies were performed a week prior to surgery and also 3-4 days, 8-10 days, and 5-11 months after surgery. During the postoperative period, $^{14}CO_2$ excretion was no higher than 0.1% dose/mM CO_2/kg, even after 6 hr. In the immediate postoperative period (during antibiotic therapy) there was no measurable $^{14}CO_2$ excretion, but after 8-10 days there was a significant increase. High excretion started within 2 hr (0.51 x 0.12) and persisted for about 8 hr. At 6 hr the increase was 20%. After 5-10 months there was a significant 10% increase in early CO_2 output (0.37 x 0.05 at 4 hr) for six hr. Mean ^{14}C respiratory loss during the first 6 hr was 2.2%, in the 8-10 day group 25.4%, and in the 5-11 month group 15.9%. The percentage of loss was increased significantly in both postoperative groups over the preoperative group and in the early as opposed to the late postoperative group. Mean fecal ^{14}C excretion was 6.6% of the preoperative dose, 50.9% in the early postoperative period, and 21.2% in the late postoperative period, indicating a decrease and compensatory increase in bile salt absorption. It is concluded that the ^{14}C-GCA test may be used to follow the adaptive response following bypass surgery.

4953 SCLEROSING CHOLANGITIS: SURGICAL SIGNIFICANCE. *(E.)* Grodsinsky, C.; Block, M. A.; Brush, B. E. (Henry Ford Hosp., Detroit, Mich.). *Henry Ford Hosp. Med. J.* 22(4):211-216, 1974.

A review is presented of six cases of possible sclerosing cholangitis. Criteria for inclusion of a case were: absence of previous biliary tract surgery and of gallstones; diffuse involvement of the extrahepatic ducts; and exclusion of cholangiocarcinoma. All had been treated for extrahepatic lesions; in two the intraoperative findings were similar. Absence of postmortem examinations made confirmation of intraoperative diagnosis impossible. At least three patterns of anatomic involvement were observed. The first, the segmental sclerosing type, results in recurrent bouts of cholangitis which may be relieved by surgical bypass of the obstruction. Stenosis is limited to a segment, usually distal, of the extrahepatic ducts. Prognosis is good. The diffuse sclerosing type, in contrast, is usually associated with chronic ulcerative colitis, and involves the entire biliary tract, intra- and extrahepatic. The third type, primary fibrosing pericholedochitis, involves the extrahepatic tract and is difficult to distinguish from other lesions causing chronic inflammation in this region. Subsequent clinical course after surgery must be reviewed to establish diagnosis. It is suggested that all possible mechanical methods of relief through surgery should be attempted, and steroids administered as an alternative where the first is ineffective or impossible.

4954 BILIOBILIARY FISTULA. A TRAP IN THE SURGERY OF CHOLELITHIASIS. *(E.)* Corlette, M. B.; Bismuth, H. (Paul Brousse Hosp., Villejuif, France). *Arch. Surg.* 110(4):377-383, 1975.

Case studies are presented for 24 patients (5 men and 19 women, average age 60.2 yr) treated for calculous biliobiliary fistula. Jaundice was the most common symptom, usually sudden in onset and associated with pain. The duration of biliary symptoms ranged from 15 days to 20 yr. Marked weight loss occurred in six. Bilirubin ranged from 2.5-14.8 mg/100 ml; alkaline phosphatase, 35-600 IU. At operation a constant and important finding was marked adhesions in the right upper quadrant fusing the adjacent organs into a chronic inflammatory mass. The gallbladder was shrunken and thickly scarred in all but two patients, in whom it was necrotic and removed in fragments. In no case was there a distinguishable line of demarcation between gallbladder and main bile duct, and the latter could not be readily dissected from the gallbaldder. In 18 cases the location in which an abnormal communication occurred between gallbaldder and main bile duct was between the Hartmann pouch or the ampulla of Vater and the hepatic duct. In six cases the gallbladder neck was continuous with the main bile duct, and a large direct communication existed between the gallbladder and the common duct in the trajectory of the cystic duct. A stone larger than 1.5 cm in diameter was found in 21 cases. In 11 cases a huge stone was astride the fistula, partly within the gallbladder and projecting into and obstructing the main bile duct. Treatment consisted of removal of stones and partial cholecystectomy down to the fistulized zone, leaving a remnant of gallbladder tissue about the abnormal communication. A T-tube was inserted through the fistula and the duct closed about it in 21 patients. In three cases an hepaticojejunostomy was performed. Postoperative complications included septis (two), partial transitory bile fistula, and self-limited episode of gastrointestinal tract bleeding (one each). One patient became jaundiced 4 months after closure of the fistula and at reexploration had developed a carcinoma obstructing the hepatic duct. It is emphasized that no attempt should be made to dissect the main bile duct from the gallbladder due to great danger to the duct. By opening the gallbladder peripherally and obtaining a cholangiogram, such an abnormal communication can be diagnosed. It is best treated by leaving a small collar of gallbladder tissue about the fistula and using this tissue to close the main duct over a T-tube.

4955 STUDIES IN CHOLESTASIS OF PREGNANCY. I. CLINICAL ASPECTS AND LIVER FUNCTION TESTS. *(E.)* Johnson, P.; Samsioe, G.; Gustafson, A. (Sahlgrenska Hosp., Univ. Goteberg, Sweden). *Acta Obstet. Gynecol. Scand.* 54(1):77-84, 1975.

Consecutive cases of pruritus in pregnancy (59) were investigated; 57 were without obvious dermatological causes and were further studied for clinical features related to the occurrence of lipoprotein X (LP-X) in serum and to liver function tests. The onset of pruritus due to cholestasis was during the third trimester in 65% of the patients. The occurrence of new cases was highest in the sixth and eighth months of pregnancy. Emesis was more common among patients with cholestatis (75%) than among controls (58%). Gallbladder disease was more frequent in pregnant women with pruritus than in controls. Food and drug idiosyncracy was more common in cholestasis of pregnancy and included difficulties with penicillins, sulfonamides, strawberries, fish, and oranges. There was no significant difference in age between cholestasis of pregnancy patients and controls. The time of delivery was normal in both groups. The amount of uterine bleeding during delivery was normal in each group, as was the patient distribution among A, B, O, and Rh blood groups. The newborn infant of the mother who had suffered from pruritus during pregnancy was not afflicted with a higher perinatal mortality nor was the incidence of immaturity and dysmaturity higher than in controls. Pregnant women with pruritus due to cholestasis showed wide ranges of values for liver function tests, serum bilirubin, alkaline phosphatase, SGOT and SGPT. In only three cases was the serum bilirubin elevated, while only a minor portion of the values of alkaline phosphatase were within normal limits. SGOT and SGPT followed a pattern similar to alkaline phosphatase, increasing in relation to the length of gestation. The cholestatic cause of the pruritus was verified in the 57 patients by the presence of LP-X in serum as determined by the immunological technique. LP-X was frequently present in serum together with normal alkaline phosphatase, SGOT, and SGPT and was particularly notable in cases in whom the onset of pruritus was in the second trimester. The finding of prolonged and severe emesis early in pregnancy suggests that the basic and possibly metabolic disturbance causing cholestasis is present throughout pregnancy, even though the onset of pruritus in cholestasis of pregnancy is most frequent in the last trimester. It is suggested that the modified immunological test for the detection of LP-X in serum may be a useful diagnostic tool in the diagnosis of cholestasis of pregnancy.

4956 A RARE CASE OF CYSTIC DILATATION OF THE MAIN BILE DUCT ("CHOLEDOCHOCELE"). *(It.)* Pelizzo, M. R.; Stella, G. D.; Masutti, A. (Inst. Surg, Pathol., Univ. Padua, Italy). *Chir. Ital.* 26(5): 488-494, 1974.

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5009 HEPATIC CONJUGATION OF CHENODEOXYCHOLIC AND CHOLIC ACIDS. *(Ger.)* von Bergmann, K.; Schultheiss, H. R.; Paumgartner, G.; Preisig, R. (Inst. Clin. Pharmacol., Univ. Bern, Switzerland). *Schweiz. Med. Wochenschr.* 105(13):413-415, 1975.

5010 CHOLELITHIASIS AND ITS COMPLICATIONS. *(Rus.)* Shabanov, A. N.; Mikeladze, K. D.; Urazov, K. B. (I. M. Sechenov 1st Moscow Med. Inst., USSR). *Khirurgiia (Mosk.)* 616(5):115-120, 1974.

5011 FOLLOW-UP RESULTS OF CHOLECYSTOSTOMY FOR ACUTE CHOLECYSTITIS AND CHOLANGITIS CAUSED BY OPISTHORCHIASIS. *(Rus.)* Ziganshin, R. V.; Tretiakov, A. M. (Tyumen Med. Inst., USSR). *Khirurgiia (Mosk.)* 616(9):85-88, 1974.

5012 CHOLANGIOGRAPHY AND MANOMETRY AFTER OPERATIONS ON THE BILE DUCTS. *(Rus.)* Obukhov, V. A.; Travkin, Iu. A.; Gorbunov, V. V. (Inst. Med. Stomatol., Moscow, USSR). *Khirurgiia (Mosk.)* 616(3): 66-68, 1974.

See also, 4194, 4197, 4213, 4250, 4256, 4257, 4267, 4272, 4273, 4274, 4275, 4276, 4277, 4278, 4279, 4280, 4281, 4286, 4287, 4288, 4295, 4296, 4570, 4571, 4609, 4744, 4838, 4916, 4941, 5042, 5057, 5068, 5193.

GENERAL

5013 AMPICILLIN-ASSOCIATED DIARRHEA--A PROSPECTIVE STUDY. *(E.)* Tedesco, F. J. (Washington Univ. Sch. Med., St. Louis, Missouri). *Am. J. Dig. Dis.* 20(4):295-297, 1975.

A prospective study of 200 consecutive patients (131 women and 69 men, aged 15-91 yr) given ampicillin for various reasons showed that bowel habits changed in 32 (16%) and that 9 of the 32 (4.5%) had diarrhea. The incidence of change in bowel habits increased with total dosage and the change occurred with equal frequency after p.o. and i.v. administration of ampicillin. Proctoscopic examination of 17 patients with changed bowel habits showed edema in all patients with more than 5 bowel movements/day and erythema in 1/2 the patients. However, no case of pseudomembrane colitis was found. A comparable study of 200 patients treated with clindamycin had revealed a 21% incidence of diarrhea and a 10% incidence of pseudomembrane colitis.

5014 IMMUNOFLUORESCENCE IN DUODENAL MUCOSA OF CHILDREN WITH ACUTE ENTERITIS DUE TO A NEW VIRUS. *(E.)* Davidson, G. P.; Goller, I.; Bishop, R. F.; Townely, R. R. W.; Holmes, I. H.; Ruck, B. J. (R. Child. Hosp., Melbourne, Australia). *J. Clin. Pathol.* 28(4):263-266, 1975.

Electron microscopy of duodenal mucosa from 8 children with acute nonbacterial enteritis had shown duovirus particles in epithelial cells. Indirect immunofluorescent techniques were applied to the same tissue and showed virus antigen localized in the cytoplasm of epithelial cells of the villi. Fluorescence occurred with fluorescein-labeled antisera to human IgM but not with similarly labeled antisera to IgG or IgA. Specific IgM antibody was present in sera from infected patients as early as 2 days after the onset of symptoms. Virus particles from different patients appeared to share a common antigen since the particles fluoresced when incubated with heterologus sera. These results support the belief that duovirus was the cause of acute enteritis in the children studied.

5015 GASTROINTESTINAL BLEEDING: TREATMENT WITH INTRA-ARTERIAL VASOPRESSIN. *(E.)* Geronilla, D. R.; Sampliner, J. E.; Lerner, A. (Mt. Sinai Hosp., Cleveland, Ohio). *Am. Surg.* 41(5):321-326, 1975.

The use of selective intra-arterial vasopressin in the treatment of 17 cases (12 male, five female) of gastrointestinal hemorrhage is discussed. Vasopressin was administered by continuous pump infusion through either the celiac or the superior mesenteric arteries. Of 17 patients, 16 had bleeding coming from above the ligament of Treitz and only one patient had lower gastrointestinal bleeding. Vasopressin was infused with a starting dose of 0.4 U/min for 20-30 min in the celiac artery, then reduced to 0.2 U/min. Superior mesenteric artery infusion was started with 0.2 U/min. Vasopressin was gradually tapered after cessation of bleeding and catheter removal was accomplished in less than 3 days. The treatment stopped the gastrointestinal hemorrhage in 13 of 17 patients (76.5%). No major complications occurred. Despite the early successes of this treatment, its therapeutic indications are still not fully established. It is suggested, however, that vasopressin has a use in stabilizing the condition of the bleeding patient, providing time for full diagnostic evaluation, and converting an emergency surgical procedure to an elective one.

5016 CHEMICALLY DEFINED DIET IN THE TREATMENT OF KWASHIORKOR. *(E.)* Habte, D.; Persson, B.; Sterky, G. (Dep. Pediatr., Haile Selassie I Univ., Addis Ababa, Ethiopia). *Acta Pediatr. Scand.* 64(2): 267-272, 1975.

A synthetic feeding mixture with an almost exclusively monomolecular composition was tested in children with kwashiorkor. Of 21 children, 13 received the synthetic food and eight received a standard diet with cow milk protein concentrate. Feeds were given every third hr at 100 mg/kg/day in the beginning, usually *via* nasogastric tube, for the first few days. Tea with sugar was given to all patients on the first day, half strength nutrient on the second day and full strength on the third day. Rectal temperature was taken before each feed and 1, 2, and 3 hr after. Venous blood was drawn on the second day of admission, every second day for the first week, and weekly thereafter, to be analyzed for blood urea nitrogen, glucose, and albumin. Hemoglobin was determined from capillary blood. There were six deaths, four in the synthetic and two in the standard-fed groups. Four were due to dehydration from diarrhea, one from hypoglycemia and one from congestive heart failure. The mortality corresponded to that of the in-patients of the hospital. The synthetic-fed group took the food from the bottle by the second or third day, showing rapid increase in appetite, while the standard-fed group had to be tube-fed for about a week. The synthetic-fed group improved more quickly than the standard-fed group, the groups taking 7.1 and 14.1 days, resp., to attain minimum weight. Subsequent weight gain was the same in both groups. Frequency of vomiting was significantly higher in the standard-fed group. There was a rise in rectal temperature in most of the patients, but was more pronounced and significant during the first half of the week in the synthetic-fed group. Albumin and blood urea nitrogen showed a progressive rise in both groups and became significant in the standard-fed group on day eight and the synthetic-fed group on day 15. There was also a significant increase in hemoglobin concentration during the first 3 weeks in the synthetic-fed group only. It is concluded that a completely chemically-defined diet can successfully reverse acute kwashiorkor, with minimum weight reached sooner and with less protein than the standard diet.

5017 IMPORTANCE OF MULTIPLE EPISODES OF HYPOXIA OR COLD STRESS ON THE DEVELOPMENT OF ENTEROCOLITIS IN AN ANIMAL MODEL. *(E.)* Barlow, B.; Santulli, T. V. (Coll. Physicians Surg., Columbia Univ., New York, N.Y.). *Surgery* 77(5):687-690, 1975.

The effects of cold stress or of the number of episodes of cold stress or hypoxia on the development of acute necrotizing enterocolitis was investigated in the rat. Split litters of newborn Sprague-Dawley rats were used for breast-fed and formula-fed groups for each experimental condition. Cold stress by refrigeration for 5 min at 7 C was administered once daily for 1, 2, or 3 days for some groups. Hypoxia by enclosure of the animals in a plastic bag for 3-5 min was administered once daily for 1, 2, 3, or 4 days to other groups. All rats were given an oral innoculum of *Klebsiella* bacteria at birth. Fecal and blood cultures and pathological examination of the gut were performed on all rats. Diseased rats were killed when in a terminal state, and healthy survivors when 7 days old. None of the breast-fed litter mates in the cold or hypoxia stressed groups showed any pathological changes. Stool cultures showed rare gram-negative colonies at 7 days. The formula-fed rats showed development of necrotizing enterocolitis in direct relation to the number of stress episodes. The disease occurred at 2-5 days of age in 60% after one, and 100% after two or more cold stress episodes. Hypoxia caused the disease in 20% after one stress, 60% after two, 80% after three, and 100% after four. Fecal and blood cultures all showed heavy *Klebsiella* growth. It is concluded that a critical amount of enteric ischemia, as caused by various forms of stress, is required to initiate enterocolitis, and that breast milk protects against the disease by control of bacterial growth.

5018 USE OF AN ORAL ELEMENTAL DIET IN INFANTS WITH SEVERE INTRACTABLE DIARRHEA. *(E.)* Sherman, J. O.; Hamly, C.; and Khachadurian, A. K. (Child. Mem. Hosp., Chicago, Ill.). *J. Pediatr.* 86(4):518-523, 1975.

The efficacy of an oral elemental diet, Vivonex, in the treatment of severe intractable diarrhea in 27 infants (1 day to 9 months of age) and the diet's effect on nitrogen balance, plasma amino acids, lipid metabolism and acid-base balance were studied. The oral elemental diet (an 18% solution) consisted of crystalline amino acids, glucose, electrolytes, and vitamins and was administered by continuous nasogastric drip. The etiology of the diarrhea was nonspecific in 23 cases and bacterial in four. Diarrhea was controlled in 24 of 27 patients on the elemental diet, and the mean weight gain was 28 g/day. The mean length of treatment was 24 days. Some of the infants received standard Vivonex and others received Vivonex high-nitrogen diet. Those fed the standard diet received the recommended level of amino acids, but their nitrogen retention and weight gain were less than optimum. Feeding the high-nitrogen formula (4.58 g/kg/day of amino acids) resulted in acceptable nitrogen retention and weight gain. The levels of individual plasma amino acids did not directly reflect the levels in the diet. Plasma triglyceride values remained within normal limits. SGPT was elevated in two patients after 13 days on the high-nitrogen diet and this may have indicated some transient liver toxicity. The higher levels of blood urea nitrogen in those receiving the high nitrogen diet probably reflected an excessive nitrogen intake. Although the oral elemental diet offers several advantages over total parenteral nutrition, the results suggest that an elemental diet specifically designed for use in infants should be developed. However, for patients with severe intractable diarrhea not responsive to conventional therapy, the presently available elemental diets represent a reasonable therapeutic alternative.

5019 AN APPLICATION OF SPECIAL ANALYSIS TO THE PROCESSING OF BIOELECTRIC VISCERAL SIGNALS. *(Fr.)* Tonkovic, S.; Penaud, J.; Thouvenot, J.; Mountafian, J. P. (Lab. Biomed. Electron., Fac. Electrotech., Zagreb, Yugoslavia). *Med. Biol. Eng.* 13(2):266-271, 1975.

Cutaneous abdominal electrodes were used to study overall bioelectric digestive activity in eight subjects, aged 20-25 yr. Two pairs of points symmetrically located on each side of the midline, one pair just below the rib cage and the other just above the pubis, were used for bipolar derivation of four signals. The sequential organization of the digestive motor process permits consideration of the signal as stationary within a defined interval. Therefore, the methods of spectral analysis may be applied to the values determined during the sequences of digestive activity. The power spectra produced by the eight subjects were statistically alike. A very good correlation was found between the frequencies recorded by this method and those reported in the literature and derived by various invasive physiological methods. The study of the distribution of energy contained in each derivation in a family of spectra permits determination of optimal electrode placement.

5020 CHRONIC DIARRHEA IN CHILDHOOD. A NEW LOOK AT AN OLD PROBLEM. *(E.)* Gall, D. G.; Hamilton, J. R. (Dep. Pediatr., Univ. Toronto, Canada). *Pediatr. Clin. North Am.* 21(4):1001-1017, 1974.

5021 CONGENITAL GRANULAR-CELL MYOBLASTOMA. *(E.)* Cussen, L. J.; MacMahon, R. A. (Dep. Pediatr., Monash Univ., Melbourne, Australia). *J. Pediatr. Surg.* 10(2):249-253, 1975.

5022 ANGIOGRAPHIC EVALUATION OF PATIENTS WITH CHRONIC GASTROINTESTINAL BLEEDING. *(E.)* Sheedy, II, P. F.; Fulton, R. E.; Atwell, D. T. (Mayo Clin., Rochester, Minn.). *Am. J. Roentgenol. Radium Ther. Nucl. Med.* 123(2):338-347, 1975.

5023 CLINICAL PROBLEMS RELATED TO THE USE OF DRUGS IN MALNUTRITION. *(E.)* Poskitt, E. M. E. (Child. Hosp., Birmingham, England). *Proc. Nutr. Soc.* 33(3):203-207, 1974.

5024 GASTRIN IN GASTROINTESTINAL DISEASE. *(Fr.)* Brassinne, A. (Fac. Med., Univ. Liege, Belgium). *Rev. Med. Liege* 29(24):745-750, 1974.

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5028 EMBRYONIC ANTIGENS AND GASTROINTESTINAL TUMORS: CLINICAL SIGNIFICANCE. *(Rum.)* Belascu, M. (Reg. Hosp., Bistritsa, Rumania). *Cluj. Med.* 47(2):435-442, 1974.

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5031 DIARRHEA IN INFANTS AND CHILDREN. *(Fr.)* deBrunhoff, M. (no affil.). *Pediatre (Clichy)* 10(48):277-290, 1974.

5032 THE USE OF INTERFERON TO PREVENT ACUTE RESPIRATORY DISEASES IN PATIENTS WITH INTESTINAL INFECTIONS. *(Rus.)* Feklisova, L. F.; Kuznetsov, V. P.; Vermgo, N. H.; Gureva, T. A. (M. F. Vladimirskii Res. Inst. Clin. Med., Moscow, USSR). *Vopr. Olch. Materin. Det.* 19(11):86, 1974.

5033 THE CLINICAL FEATURES OF ACUTE INFECTIOUS ENTEROCOLITIS IN ADULTS AND CHILDREN. *(Rus.)* Zhuravleva, L. V.; Maltseva, I. V. (State Inst. Postgrad. Med., Leningrad, USSR). *Sov. Med.* (1):154-155, 1975.

5034 FIBRINOGEN DEFICIENCY DURING THE COURSE OF TOXIC DIARRHEA. *(Pol.)* Kosinski, J.; Czarnecki, J. (W. Szenajch Munic. Child. Hosp., Torun, Poland). *Pediatr. Pol.* (2):239-240, 1975.

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5049 DISACCHARIDASE ACTIVITY IN SMALL INTESTINAL MUCOSA DURING INFANTILE ENTEROPATHY. *(Pol.)* Hager-Malecka, B.; Karczewska, K.; Dyduch, A. (no affil.). *Pediatr. Pol.* 49(12):1471-1477, 1974.

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5055 THE ROLE OF THE LYMPH VESSEL SYSTEM IN DISEASES OF THE GASTROINTESTINAL TRACT. *(Ger.)* Meyer-Burg, J. (Steglitz Clin., Free Univ. Berlin, Germany). *Leber Magen Darm* 4(6):308-312, 1974.

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5059 FUNCTIONAL RESULTS AFTER DUODENOPANCREATECTOMY (WITH SPECIAL CONSIDERATION OF IRON ABSORPTION, BREATH TEST, AND SERUM GASTRIN). *(Ger.)* Maurer, W.; Kaufmann, M.; Kaess, H.; Voirol, M.; Borel, G. A.; Deperrex, U.; Miller, G. (Burgersp., Solothurn, Germany). *Dtsch. Med. Wochenschr.* 99-(38):1863-1866, 1974.

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5069 CLINICAL ASPECTS AND DIAGNOSIS OF OBSTRUCTIVE JAUNDICE IN TUMOR GROWTH. *(Rus.)* Shubin, B. M.; Rutoryan, E. S. (P. A. Gertsen Res. Inst. Oncol., Moscow, USSR). *Vopr. Onkol.* 21(2):40-44, 1975.

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See also, 3799, 4201, 4202, 4203, 4207, 4208, 4210, 4297, 4311, 4317, 4347, 4350, 4553, 4608.

GENERAL

Parasitology

5131 AMEBIC COLITIS MISTAKEN FOR INFLAMMATORY BOWEL DISEASE. *(E.)* Tucker, P. C.; Webster, P. D.; Kilpatrick, Z. M. (Med. Coll. Georgia, Augusta). *Arch. Intern. Med.* 135(5):681-685, 1975.

Ten cases of patients with amebic colitis which had been mistaken for inflammatory bowel disease was described. Similarities in clinical findings made diagnosis difficult; multiple stool examinations failed to demonstrate ova or trophozoites of *Entamoaba histolytica.* The indirect hemagglutination test was found to be a reliable diagnostic test in the evaluation of patients with inflammatory bowel disease. Substances taken early for symptomatic relief of diarrhea may interfere with the detection of amebas and lead to false-negative results; thus, amebiasis should be considered during the initial evaluation of patients with chronic diarrhea, especially if the diarrhea is bloody. The routine use of the serological test for amebiasis is recommended, followed by amebiasis treatment for all patients with colitis who have diagnostic indirect hemagglutination titers.

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Cases of bilharziasis caused by *Schistosoma mansoni* are reported. All six patients (five men, one woman, aged 21-58 yr) had just returned from a stay in Chad of 2 to 18 yr. Symptoms included asthenia, anorexia, nausea, vomiting, hyperthermia, abdominal cramps, diarrhea, bloody stool, icterus, and weight loss; two patients showed no symptoms at all. Examination of the urine showed no evidence of parasites in any of the cases, and examination of the stool showed only one egg in only one case. Rectal mucosal biopsy in five patients gave positive results; histological examination revealed tuberculoid granulomas in the submucosa, the larger of which contained eggs or egg fragments. The patient who did not undergo rectal mucosa biopsy had previously had a liver needle biopsy which proved the diagnosis of *S. mansoni* infection in addition to viral hepatitis. In all cases, there was peripheral eosinophilia, ranging from 730 - 1558 cells/ml. All patients were treated with niridazole, which produced side effects of headaches, myalgia, anorexia, nausea, vomiting, slowing of intestinal transit, and minor electrocardiogram changes. The absence of major side effects on the central nervous system is attributed to the mitigating effects of diazepam during treatment and the absence of portal hypertension at the time of treatment. The side effects were consistently more severe for the two patients with liver involvement. Eosinophilia increased during treatment, but gradually returned to normal several months after treatment.

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See also, 4193, 4242, 4282.

GENERAL

Regional Enteritis

159 IN VITRO STUDIES OF ULCERATIVE ILEOJEJUNITIS. *(E.)* Klaeveman, H. L.; Gebhard, R. .; Sessoms, C.; Strober, W. (Natl. Inst. Arthritis etab. Dig. Dis., Bethesda, Md.). *Gastroenterology* 8(3):572-582, 1975.

ehavior in organ culture and local immunoglobulin esponses were studied in tissue from a patient with chronic ulcerative ileojejunitis. The patient was a 42-yr-old Jewish male who presented with diarrhea and abdominal distention, digital clubbing and trace pedal edema. Small bowel x-rays showed an abnormal loop in the left upper quadrant with nodular indentations. Peroral jejunal biopsy showed complete villous atrophy with cuboidal pyknotic epithelial cells and a dense infiltrate of plasma cells, eosinophils and histiocytes. Intestinal biopsies were taken with the instrument placed fluoroscopically at the ligament of Treitz, rinsed in Krebs-Ringer bicarbonated buffer, cut into pieces 1-2 cm in diameter, and cultured in the presence and absence of gluten peptides. Specimens were also incubated in L-^{14}C-leucine for 90 min, the tissue homogenized, and the resulting homogenate incubated for 3 hr with anti-IgA antibodies linked to bromacetyl cellulose. Leucine incorporation into IgA after a 7 day gluten-containing diet was 32,647 counts/min/mg protein in comparison to 5830 counts/min/mg protein in eight normal individuals. Studies while the patient was on a gluten-free diet still showed an elevated count (34,000) but steroid therapy brought the values doen to 6814 after two months. Initial and 48 hr alkaline phosphatase values for organ cultured tissues were 51 and 262 μM *p*-nitrophenyl phosphate formed/g tissue/min, resp., after the gluten free diet and 108 and 497, resp., after the gluten-containing diet. In culture studies performed when the patient was on a gluten free diet, before the institution of corticosteroid therapy, initial alkaline phosphatase increased from 51 - 262 U. A similar increase to 242 U occured when gluten was present in the medium. It is concluded that chronic ulcerative ileojejunitis is a complication of gluten-sensitive enteropathy related to a non-gluten dependent pathological process involving the local immunological system.

5160 THE THYROID IN ULCERATIVE COLITIS AND CROHN'S DISEASE. IV. THYROID HORMONE BINDING PROTEINS.

(E.) Jarnerot, G.; Truelove, S. C.; von Schenck, H. (Radcliffe Infirm., Oxford, England). *Acta. Med. Scand.* 197(1/2):95-98, 1975.

The serum concentrations of the thyroid binding proteins were studied in patients with ulcerative colitis or Crohn's disease. Of the 20 patients studied, 11 had ulcerative colitis, of whom 8 had universal, and 3 distal involvement. Of the nine with Crohn's disease, 4 had colonic disease, three small bowel disease, and two ileocecal inflammation. Ten of the patients were on corticosteroid treatment (30-60 mg prednisolone/day). Controls were 20 healthy subjects not on any medication. Serum thyroxine binding globulin and thyroxine binding prealbumin were measured by agar gel electrophoresis and serum albumin was measured with bromcresol green. Serum thyroxine was determined by competitive protein binding, and thyroid stimulating hormone by radioimmunoassay. Thyroxine binding globulin levels were significantly higher in patients not taking corticosteroids than in controls (28.1 and 19.3 μg/100 ml, resp.), while thyroxine binding prealbumin levels were significantly lower (90.9 and 142.8 μg/100 ml, resp.). Thyroxine levels did not differ significantly, nor did triiodothyronine uptake. Patients receiving corticosteroids had significantly lower serum albumin levels than those not recieving them (32.3 and 40.3 μg/100 ml, resp.). The correlation between thyroxine binding prealbumin and albumin was significant when estimated for patients and controls as one group. Patients with no corticosteroid therapy had a significantly higher free thyroxine index than the controls (4.4 and 3.9 μg/100 ml, resp.). The thyroid stimulating hormone level was normal in all patients and controls. It is concluded that in ulcerative colitis and Crohn's disease changes can occur in serum concentrations of thyroxine binding proteins which may cause alterations in thyroid tests.

5161 THE THYROID IN ULCERATIVE COLITIS AND CROHN'S DISEASE. III. THE DAILY FRACTIONAL TURNOVER OF THYROXINE.

(E.) Jarnerot, G.; Truelove, S. C.; Warner, G. T. (Radcliffe Infirm., Oxford, England). *Acta. Med. Scand.* 197(1/2):89-94, 1975.

Patients with ulcerative colitis or Crohn's disease were studied with respect to alterations in thyroxine metabolism. There were five patients with ulcerative colitis, of whom four had universal and one had distal involvement; and six patients with Crohn's disease, of whom three had extensive colonic disease, two widespread small bowel disease, and one ileocecal inflammation. Six of the 11 were severely ill and seven were treated with corticosteroids. None had evidence of thyroid disease. Eight healthy patients, of whom none were on any medication, served as controls. The thyroid was blocked by 240 mg potassium iodide given p.o. in two doses over 24 hr, and the blockade maintained by 60 mg twice daily throughout the experiment. One day after the start of the blockade, blood was drawn for T_4 estimation, immediately followed by i.v. injection of 10 μCi ^{131}I-T_4 in normal saline. Readings were made with a whole body counter once daily for six to ten days, considering the value 24 hr after administration as 100%. A thyroid count was taken 24 hr after injection and compared with a similar control count from the thigh. The daily retained radioactivity plotted semi-logarithmically produced a straight line. The thyroid count 24 hr after injection showed no appreciable amounts of the dose had been taken up by the thyroid. The patients had a significantly shorter ^{131}I-T_4 biological half-life and a higher daily fractional turnover than the controls. Severely ill patients had more pronounced changes than the mildly or moderately ill, or the controls. Corticosteroid treatment did not change either the half-life or the daily fractional turnover. Extrathyroidal T_4 iodine pools were not significantly smaller for the patients as a group than for the controls. Plasma T_4 and total T_4 iodine disposed/day did not differ significantly between patients and controls. It is concluded that patients with severe Crohn's disease or ulcerative colitis have increased daily fractional turnover of T_4.

5162 A STUDY OF THE CELLULAR INFILTRATE OF THE PROXIMAL JEJUNAL MUCOSA IN ULCERATIVE COLITIS AND CROHN'S DISEASE.

(E.) Ferguson, R.; Allan, R. N.; Cooke, W. T. (Gen. Hosp., Birmingham, England). *Gut* 16(3):205-208, 1975.

The inflammatory cell infiltrate was studied from proximal jejunal biopsies of patients with ulcerative colitis, and patients with Crohn's disease. Of 20 ulcerative colitis patients, seven had active disease, six were on steroid therapy, eight had total colonic involvement, five had distal colonic involvement, and seven had undergone panproctocolectomy. Of 26 patients with Crohn's disease, 16 had active disease, six were on steroids, four had known jejunal involvement, six had terminal ileal and colonic involvement, three colonic involvement only and four had ileal involvement only. For controls, 20 obese patients undergoing jejunoileal bypass were used. Biopsy specimens were taken from the first 10 cm of jejunum. Sections 5 μ thick were made and stained with hematoxylin and eosin. Cell counts were made in at least three areas of each section and the number of cells/mm^2 of lamina propria and cells/mm length of epithelium calculated. Plasma cells, lymphocytes, eosinophils, neutrophils, reticulum cells, or other cells in the lamina propria were counted. There were no differences in the lymphocyte counts in either tissue between any of the groups. However, patients with ulcerative colitis had higher lamina propria plasma cell counts (2268) than controls (1050) and Crohn's disease patients had higher counts (3002) than the ulcerative colitis patients. There were no significant differences between those with active or inactive disease, or those on steroid therapy and those not. In the ulcerative colitis patients, there were no significant differences between those with total colonic involvement and those with distal involvement, nor between all these patients and those who had previously undergone panproctocolectomy. In patients with Crohn's disease there were no differences between the various types of involvement. In this disease, the plasma cells outnumbered the lymphocytes in 15 biopsies. This was seen in only four ulcerative colitis patients, three of whom had active disease. It is concluded that raised plasma cell counts are present in ulcerative colitis and Crohn's disease, and may indicate an abnormal antigen in the proximal intestine.

5163 STRICTURE OF THE ANORECTUM IN CROHN'S DISEASE INVOLVING THE COLON. *(E.)* Greenstein, A. J.; Sachar, D. B.; Kark, A. E. (Mount Sinai Hosp., City Univ. New York, N.Y.). *Ann. Surg.* 181(2):207-212, 1975.

Twelve patients with anorectal stricture in a series of 160 patients with non-specific colitis (excluding ulcerative colitis) were studied. Of the 12, four had granulomatous colitis and eight had ileocolitis. Their ages ranged from 10-79 yr at the time of stricture development, but the mean duration from onset to the development of significant stricture was 14 yr. Nine of the 12 patients had strictures beginning 1/2 to 4 cm from the anal verge, three of which were short, fibrous, and diaphragmatic. The remaining five extended into the rectum for varying distances. Three of the 12 had strictures beginning 4, 5, and 7 cm from the anal verge and were either annular (under 2 cm) or tubular (over 2 cm), one of them extending to the rectosigmoid junction. Incontinence was found in three of the 12. Other pertinent clinical features were perianal disease (in 10), associated fibrous stricture or radiological narrowing (in 10) and discontinuity of the disease. Associated internal fistulae occurred in five and shortening of the bowel in three patients. Six had noncaseating granulomas. It is concluded that anorectal stricture occuring in Crohn's disease presents a major clinical problem, may lead to partial or complete obstruction, and may be associated with perianal disease, multiple fistulae, proximal stricturing in the bowel, and activity of Crohn's disease elsewhere.

5164 CHANGES IN THE BIDIRECTIONAL SODIUM FLUX ACROSS THE INTESTINAL MUCOSA IN CROHN'S DISEASE. *(E.)* Allan, R.; Steinberg, D. M.; Dixon, K.; Cooke, W. T. (Gen. Hosp., Birmingham, England). *Gut* 16(3):201-204, 1975.

Bidirectional sodium flux and net sodium absorption were compared in 10 patients with Crohn's disease and 11 patients with ulcerative colitis. All patients had been given a panproctocolectomy and ileostomy 1-15 yr previously, and were in good health with no radiological abnormality. After a 4 hr fast the patients were fitted with a nasogastric tube and a temporary ileostomy bag connected to a volume meter. Hartmann's solution (sodium 154 mEq/liter) was infused through the tube at 33 ml/min for 1 hr after an ileostomy output of 20-40 ml/min was established. Then 4 μCi ^{22}Na in 20 ml Hartmann's solution and 5 ml 1% BSP solution were given in a bolus *via* the tube, and the normal infusion of Hartmann's solution was continued for a second hr. The ileostomy output was measured by liquied scintillation counter in four 15 min aliquots and a fifth sample taken after the second hr. The last sample represented the concentration of label absorbed and resecreted from plasma to lumen, and was subtracted from the label absorbed and resecreted from plasma to lumen, which was subtracted from the label in the first four aliquots to give the fraction absorbed. The mean ileostomy output was significantly greater in the Crohn's disease patients than those with ulcerative colitis during the first hr but not during the second. The mean sodium flux both from lumen to plasma and from plasma to lumen was significantly lower in the Crohn's disease patients (3.30 and 2.30 mEq sodium/min, resp.) than in the ulcerative colitis patients (6.15 and 4.81 mEq sodium/min, resp.). There was no significant difference in the net absorption of sodium in the two groups. It is concluded that in Crohn's disease the gut may be more extensively involved than is shown by radiological appearance.

5165 THE THYROID IN ULCERATIVE COLITIS AND CROHN'S DISEASE. I. THYROID RADIOIODIDE UPTAKE AND URINARY IODINE EXCRETION. *(E.)* Jarnerot, G. (Med. Sch., Linkoping Univ., Sweden). *Acta Med. Scand.* 197(1/2):77-81, 1975.

Two studies were conducted to compare the prevalence of iodine depletion in chronic inflammatory bowel disease patients and healthy controls. The first study involved 50 patients, 10 of whom had distal and 10 universal ulcerative colitis; and 28 had Crohn's disease, of whom four had anorectal lesions, 11 more widespread colonic lesions, and 13 small bowel lesions. Two patients had unclassified colitis. During the study 15 patients were given corticosteroids, and 32 Salazopyrin. All had 24 hr urine samples collected and analyzed for iodine excretion. Forty of the patients, of whom 15 were on a milk free diet, answered a dietary questionnaire, and were compared to 102 normal controls. The second study involved 38 patients of whom five had distal and nine universal ulcerative colitis, and 23 had Crohn's disease, of whom three had anorectal lesions, nine widespread colonic lesions, and 11 small bowel lesions. Thirty five were also included in the first study. Thirteen were given corticosteroids and 24 salicyclazosulfapyridine. Of the 35 patients in both studies, 12 were on corticosteroids. All second study patients had thyroid radioiodide uptake measured 24 hr after an oral test dose of 10 μCi ^{131}I. Of the 38 patients who answered a dietary questionnaire, 10 were on a milk-free diet. All were compared with a group of 36 healthy controls. The patient groups had considerably lower urinary iodine excretion levels and higher thyroid ^{131}I uptake levels than the corresponding control groups. All differences were significant except for radioiodide uptake in the males. Iodine excretion was significantly higher in the males than the females in both patient and control groups. Of the 50 patients in the first study, 10 had a 24 urinary iodine excretion of less than 40 μg, while five of the 102 controls did, a significant difference. Of 50 patients, 26 excreted less than 70 μg, compared to 28 of the 102 controls, a highly significant difference. Of the 38 patients in the second study, 16 had a 24-hr radioiodide uptake of 50% or more, while only four of the 36 controls had as great an uptake, a significant difference. Neither corticosteroid, salicylazosulfapyridine, nor milk-free diet had any effect on iodine excretion or iodide uptake. Patients not treated with corticosteroids, however, showed a highly significant negative correlation between excretion and uptake. There was no relation between excretion or uptake and the site of bowel disease. It is concluded that patients with chronic inflammatory bowel disease have increased thyroid uptake and diminished urinary iodine excretion, indicating iodine depletion.

5166 THE DISTRIBUTION OF MUCOSAL ANTIBODIES IN THE BOWEL OF PATIENTS WITH CROHN'S DISEASE.

(E.) Green, F. H. Y.; Fox, H. (Dep. Pathol., Univ. Manchester, England). *Gut* 16(2):125-131, 1975.

The relative amounts of immunoglobulin-containing cells were studied in the affected gut areas of patients with Crohn's disease. Surgically resected unfixed specimens of large and small intestine were obtained from 24 patients. Blocks were taken from the resection lines, ulcerated areas, affected areas without ulceration, unaffected areas, and, when possible, attached mesenteric lymph nodes. Control blocks were taken from both large and small intestine from patients with carcinoma of the colon, and from normal peroral jejunal biopsies. The sections were fixed in acetone and stained directly or indirectly with anti-human IgA, IgM, IgG, antisera conjugated with fluorescein and isothiocyanate, and IgE antisera conjugated with fluorescein only. For controls, unstained sections were used to estimate autofluorescence. The identity of specifically fluorescent cells was checked by photographing them and restaining them with hematoxylin and eosin. In the Crohn's disease, the unaffected areas showed a slight increase in the IgA-containing cells of the lamina propria, while the epithelial IgA distribution was similar to that of controls. There was a definite increase in number of IgM-containing cells, to amounts equalling that of the IgA-containing cells, the epithelial fluorescence of the two showing a similar pattern in 19 papers. Distribution of IgG, IgD, and IgE-containing cells was similar to that of controls. Sections from abnormal but non-ulcerated areas showed a marked decrease in lamina propria IgA-containing cells. Intraepithelial IgA was reduced proportionately. IgM cell number was reduced relative to the unaffected areas but not to the controls. Epithelial IgM was largely absent. Cells containing other immunoglobulins did not differ significantly from controls or unaffected areas. In the ulcerated sections the inflammatory infiltrate contained moderate numbers of IgA, IgM, and IgG-containing cells in descending order. Lymphoid follicles containing predominantly IgA-containing cells were common in the submucosa, subserosa, and lymph nodes. The controls contained a predominance of IgA-containing cells in the plasma cells, and IgA in the epithelial cells. No epithelial fluorescence was seen when stained for other immunoglobulins. It is concluded that there is a focal reduction in IgA in the lamina propria and epithelium, confined to histologically abnormal areas in Crohn's disease, especially where the mucosa is still intact.

5167 FAT-REDUCED DIET IN THE SYMPTOMATIC TREATMENT OF PATIENTS WITH ILEOPATHY: A FOLLOW-UP STUDY.

(E.) Andersson, H. (Sahlgrenska Hosp., Univ. Goteborg, Sweden). *Nutr. Metab.* 17(2):102-111, 1974.

Of 13 patients with chronic diarrhea who favorably responded to a low-fat diet in a previous clinical study, 10 were followed up for 3-27 months while continuing the diet. Of the 10, 9 had Crohn's disease and 7 of these had had an ileal resection. The 10th patient had had an extensive small bowel resection following a car accident. After the completion of the initial clinical study, the patients were given individually worked out diets adapted for use at home and work, containing about 40 g fat/day. All patients were given vitamin supplements, and one took cholestyramine during the study. Most patients were interviewed and given blood tests and routine examinations every 34 months. Daily intake of energy and nutrients was determined and bowel habits were registered. After the course of study the patients were readmitted to the clinic and given the same standard low-fat diet they were given in the initial clinical study. Nitrogen, potassium and sodium in feces, urinary calcium excretion, and total body potassium were determined. Most patients had few or no difficulties in following the diet. Mean decrease in energy intake between the periods before and after treatment was about 600 kcal/day. Fat intake was reduced from about 155 g to about 50 g/day. Protein intake was not affected except for an appreciable increase in 2 patients. Bowel evacuations were reduced from 10-30/day before treatment to no more than 3/day after treatment, with 1 exception. In spite of the decreased caloric intake, body weight did not change significantly during the study. Total body potassium increased significantly in 5 patients. All patients showed low serum albumin, 2 abnormally so. In the clinic, following the at-home study, the daily number of stools and fecal excretion of fat, water, sodium, and nitrogen were all similar to values during the initial clinical period and the study period. It is concluded that a low-fat diet is beneficial in chronic diarrhea from ileal disease, even outside the hospital for a protracted period of time.

5168 CROHN'S DISEASE OF THE STOMACH: THE "RAM'S HORN" SIGN. *(E.)* Farman, J.; Faegenburg, D.; Dallemand, S.; Chen, C. K. (Downstate Med. Cent., Brooklyn, N.Y.). *Am. J. Roentgenol. Radium Ther. Nucl. Med.* 123(2):242-251, 1975.

The radiological appearance of the stomach in 12 patients (9 men and 3 women; average age 30 yr) with Crohn's disease was studied. All had small bowel disease of varying extent and severity. Duodenal involvement was present in 5, colonic in 4, and esophageal in 1. In 9 of the 12, involvement of the antrum of the stomach produced a tubular shape with conical narrowing: the "ram's horn" configuration. In these cases the stomach distended poorly and peristalsis was sluggish and infrequent. In 2 other patients there was a pyloroduodenal deformity and in 1, irregular, abnormal coarse antral mucosal disease. Gastric dilation resulting from pyloroduodenal stenosis was present in 2 cases and excess retained gastric secretion in 3. The gastric mucosa ranged in appearance from coarsened and pebbly to smooth. It is concluded that gastric Crohn's disease can be diagnosed radiologically by the presence of a smooth tubular, poorly distensible antrum with sluggish peristalsis; cobblestone antral folds, moderate pyloroduodenal outlet obstruction, excess gastric secretions, and presence of Crohn's disease elsewhere in the gastrointestinal tract.

5169 REGIONAL ENTERITIS OF THE DUODENUM. *(E.)* Thompson, W. M.; Cockrill, H. Jr.; Rice, R. P. (Duke Univ. Med. Cent., Durham, N. C.). *Am. J. Roentgenol. Radium Ther. Nucl. Med.* 123(2):252-261, 1975.

The characteristic roentgen features of duodenal regional enteritis were reviewed in 23 patients. Of the 23, 16 underwent surgery and presented with histological evidence of Crohn's disease. Diagnosis of Crohn's disease was also made by roentgenograms of the upper and lower gastrointestinal tract in each case. Clinically, 22 of the patients had abdominal pain and diarrhea, and 16 had vomiting and postprandial fullness. Seven were anemic and 16 had significant weight loss. In 6 patients the initial clinical diagnosis was peptic ulcer disease. Seven who showed duodenal changes had no upper gastrointestinal symptoms other than occasional pain. Roentgenographically, the appearance of the patients was similar to those with regional enteritis of the small intestine. There was concurrent gastric involvement in seven cases. The early stages of the disease showed a more subtle and less specific involvement than advanced regional enteritis. Findings included blunted, thickened, and possibly disorganized mucosa, and moderate narrowing of the lumen with some spasm. The most characteristic change in the late stages of the disease was the pseudopost Billroth I sign, in which the antrum, pylorus, and duodenal bulb are blended into a single tubular structure. Other late changes included loss of normal mucosal pattern and appearance of pseudodiverticula with ulceration, and occasionally a nodular appearance of the mucosa; a smooth, tapered stenosis sometimes resulting in obstruction, and sometimes involving the apex of the duodenal bulb; and duodenal fistulae, usually from the transverse colon to the second portion of the duodenum. It is concluded that Crohn's disease of the duodenum is more common than previously thought, and tubular narrowing of the antrum, pylorus, duodenal bulb, and second portion of the duodenum is diagnostic of the condition.

5170 TRANSPLANTATION ANTIGENS IN CROHN'S DISEASE: LINKAGE OF ASSOCIATED ANKYLOSING SPONDYLITIS WITH HL-AW 27. *(E.)* Russell, A. S.; Percy, J. S.; Schlaut, J.; Sartor, V. E.; Goodhart, J. M.; Sherbaniuk, R. W.; Kidd, E. G. (Dep. Med., Univ. Alberta, Edmonton, Canada). *Am. J. Dig. Dis.* 20(4):359-361, 1975.

The HL-A antigen profile was studied in 77 patients with Crohn's disease to determine if any significant linkage exists between a genetic susceptibility to this disease and any of the transplantation antigens. A microcytotoxicity technique was used to determine the complete HL-A antigen profile in the Crohn's disease patients, 11 of whom had ankylosing spondylitis, and 600 controls. The profiles did not differ significantly between patients and controls. However, among the 11 males with ankylosing spondylitis, 10 patients were positive for HL-Aw 27; the frequency of this antigen in this series resembled that found in spontaneous ankylosing spondylitis. Among the other 66 Crohn's disease patients, three females had HL-Aw 27 with no evidence of sacroiliitis. In seven patients with Crohn's disease and associated spondylitis, the spondylitis preceded Crohn's disease by 1.5-10 yr, while in two patients the diseases appeared at approximately the same time and in two others Crohn's disease preceeded the spondylitis by 0.5-3 yr. The results suggest that the HL-Aw 27 antigen may be a useful indicator of spondylitis in Crohn's disease.

5171 CLINICAL PATTERNS IN CROHN'S DISEASE: A STATISTICAL STUDY OF 615 CASES. *(E.)* Farmer, R. G.; Hawk, W. A.; Turnbull, Jr., R. B. (Cleveland Clin. Found., Ohio). *Gastroenterology* 68(4):627-635, 1975.

Clinical patterns were studied in 615 cases of Crohn's disease to determine whether initial anatomic involvement in this disease is directly related to the clinical course and prognosis. The patients represented 615 consecutive cases of Crohn's disease seen between 1966 and 1969. All data concerning these patients were subjected to statistical analysis based on determinations of anatomic involvement, clinical symptoms, course of the illness as shown by follow-up data, and surgical experience. The following initial clinical patterns were established: ileocolic pattern with involvement of the distal ileum and right colon (252 patients); small intestinal pattern with involvement of the small intestine but not the colon (176); colon pattern with colonic but not small intestinal involvement (114); and anorectal pattern with anorectal but not proximal colonic or small intestinal involvement (21). Statistically significant symptoms included rectal bleeding with colon involvement, and rectal fistulas with ileocolic or colon involvement. The statistically significant complications included: perianal fistulas, internal fistulas, and intestinal obstruction with the ileocolic pattern; perianal fistulas, toxic megacolon, and arthritis with the colon pattern; and intestinal obstruction with the small intestinal pattern. Surgery was required in 73% of the ileocolic pattern patients and 51% of the small intestinal and colon pattern patients. Anorectal involvement was rarely the initial manifestation, but frequently accompanied the ileocolic and colon patterns. There were postoperative recurrences in 27% of the patients with the ileocolic pattern, 21% of those with the small intestinal pattern, and 16% of those with the colon pattern. Death occurred in 7% of the ileocolic pattern patients, 5% of those with the colon pattern, and 4% of those with the small intestinal pattern. The data indicate that Crohn's disease should be considered as a protean disease with certain definable patterns and that anatomic involvement at the time of diagnosis bears directly on the clinical course, type of complications, and prognosis.

5172 REMEDIABLE DEFECTS IN CROHN DISEASE. A PROSPECTIVE STUDY OF 63 PATIENTS. *(E.)*

Beeken, W. L. (Dep. Med., Univ. Vermont, Burlington). *Arch. Intern. Med.* 135(5):686-690, 1975.

To identify potentially remediable abnormalities in Crohn's disease, the incidence of anemia, serum electrolyte deficiencies, defects in carbohydrate, fat, and vitamin B_{12} absorption, jejunal bacterial overgrowth, and abnormalities in intestinal protein metabolism were prospectively analyzed in 63 patients with this disorder. Radiological studies showed disease in the upper part of the small bowel in 14% of the patients, the mid-small bowel in 22%, the lower part of the small bowel in 76%, and the colon in 33%. Hematocrit values were less than 40 volume percent in 67% of the patients, and iron deficiency was found in 35%. In addition, 10 patients had low serum folate values and conventional Schilling tests with intrinsic factor were abnormal in 31 patients. Of the entire group, 44 patients had one or more potentially correctable causes of anemia; 21 had serum electrolyte abnormalities, the most common of which was hypocalcemia; 13 had abnormal lactose tolerance tests, and jejunal disease or bacterial overgrowth were possible contributing factors in six. Xylose malabsorption did not accurately reflect jejunal disease. All patients showed normal hydration and renal function. Of the 61 patients who completed fat balance testing, 19 had steatorrhea caused by a variety of factors. Derangements of protein metabolism were the most commonly encountered abnormalities: excessive enteric protein loss was present in 76%; fasting serum tryptophan values were low in 29 or 35 patients tested; fecal nitrogen and nitrogen balances were abnormal in most cases; and hypoalbuminemia was present in 16 patients. High bacterial colony counts were found in 30% of the jejunal cultures. In addition to the initial barium studies, Crohn's disease patients should be evaluated with regard to body weight, stool frequency, and anemia. A selective search for correctable abnormalities will often identify defects amenable to correction by appropriate replacement therapy.

5173 PRESTENOTIC ENTERITIS AND ENTEROCOLITIS IN CHILDREN: DESCRIPTION OF A SYNDROME AND REVIEW OF FIVE CASES. *(E.)*

Smith, E. I.; Gill, C. C. (Child. Mem. Hosp., Univ. Oklahoma Coll. Med., Oklahoma City). *South. Med. J.* 68(4): 427-430, 1975.

Case reports of five children with enteritis proximal to a stenotic area of the bowel are presented. The first patient was born with multiple congenital anomalies including a first arch syndrome and a low imperforate anus with a perineal fistula; she had perineal anoplasty on the seventh day of life. The second patient was a microcephalic male born with an imperforate anus; he had abdominoerineal anoplasty on the second day of life. The third patient (female) was born with multiple congenital anomalies including a high imperforate anus and had a colostomy performed soon after birth. The fourth case was a female born with a caudal duplication abnormality and anal atresia; she was subjected to numerous surgical procedures including a transverse colostomy as a neonate. The last case was a boy born with multiple atretic areas of the small intestine; intestinal obstruction was diagnosed at 72 hr of age. A clinical syndrome involving prestenotic enteritis and enterocolitis consisting of abdominal distention and pain, intermittent diarrhea and constipation, failure to thrive, fever, and, in some patients, extreme prostration and death was observed. The pathogenesis of this enteritis and enterocolitis was apparently related to partial mechanical obstruction of the bowel with proximal dilatation, stagnation, and capillary stasis. Acute relief from the enteritis and enterocolitis was obtained by stomal dilatation and colonic irrigation, but all patients eventually required surgical intervention. Because mortality in this disease is significant and the results of early surgical intervention are favorable, surgical intervention is encouraged at the first sign of prestenotic enteritis or enterocolitis in children. Surgical correction of the distal stenosis produced a growth spurt in the two successfully treated patients in this series without other growth-limiting diseases.

174 DIAGNOSIS OF CROHN'S RECURRENCE AFTER SUR-
GERY. *(E.)* Calvadetscher, P.; Deyhle, P.
Dep. Intern. Med. Univ. Zurich, Switzerland). *En-*
oscopy 7(1):27-29, 1975.

oloscopy was compared with clinical observation and
adiology in diagnosis of recurrent Crohn's disease
t or near the site of earlier surgery. Studies
ere done on 12 patients; the average interval be-
ween radiological and endoscopic examination was
3 days; the longest interval was 67 days. Recur-
ence was defined clinically as return of symptoms
fter a postoperative symptomless period; radio-
ogically as appearance of spiculas, cobblestone-
attern and restriction of the lumen; and endo-
copically as ulcerations and cobblestone pattern.
ndoscopy showed recurrence in 11 patients, while
adiology showed recurrence in only 3. An ulcer at
he anastomosis was shown in one case by radiology,
n contrast to 6 cases by endoscopy. Cobblestone
atterns were found by radiology in 3 of 5 patients.
hey produced clinical symptoms in 4. Clinical
ymptoms developed in 3 cases of anastomotic ulcers,
ndetected radiologically. It is concluded that en-
oscopy is superior to radiology in diagnosis of
hese recurrences, and can detect recurrences during
ymptomless phases.

175 VARIOUS MANIFESTATIONS OF REGIONAL ENTERI-
TIS AND ITS DIFFERENTIAL DIAGNOSIS BY
ADIOLOGY. *(Ger.)* Koischwitz, D.; Sobbe, A.;
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176 TWO FIRST DEGREE RELATIVES WITH DILATATION
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384):211-220, 1973.

177 CROHN'S DISEASE OF THE COLON. III. TOXIC
DILATATION OF THE COLON IN CROHN'S DISEASE.
E.) Greenstein, A. J.; Kark, A. E.; Dreiling, D.
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178 EPIDEMIOLOGICAL ASPECTS OF CROHN'S DISEASE
IN CLYESDALE 1961-1970. *(E.)* Smith, I.
.; Young, S.; Gillespie, G.; O'Connor, J.; Bell, J.
. (Stobhill Gen. Hosp., Glasgow, Scotland). *Gut*
6(1):62-67, 1975.

179 CROHN'S DISEASE OF THE COLON. II. CONTRO-
VERSIAL ASPECTS OF HEMORRHAGE, ANEMIA AND
ECTAL INVOLVEMENT IN GRANULOMATOUS DISEASE INVOLVING
HE COLON. *(E.)* Greenstein, A. J.; Kark, A. E.;
reiling, D. A. (Mt. Sinai Sch. Med., City Univ. New
ork, N.Y.). *Am. J. Gastroenterol.* 63(1):40-48,
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